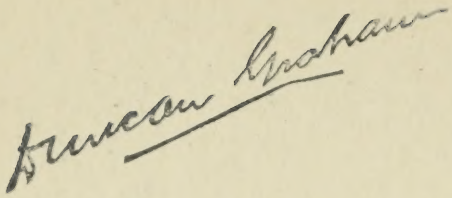

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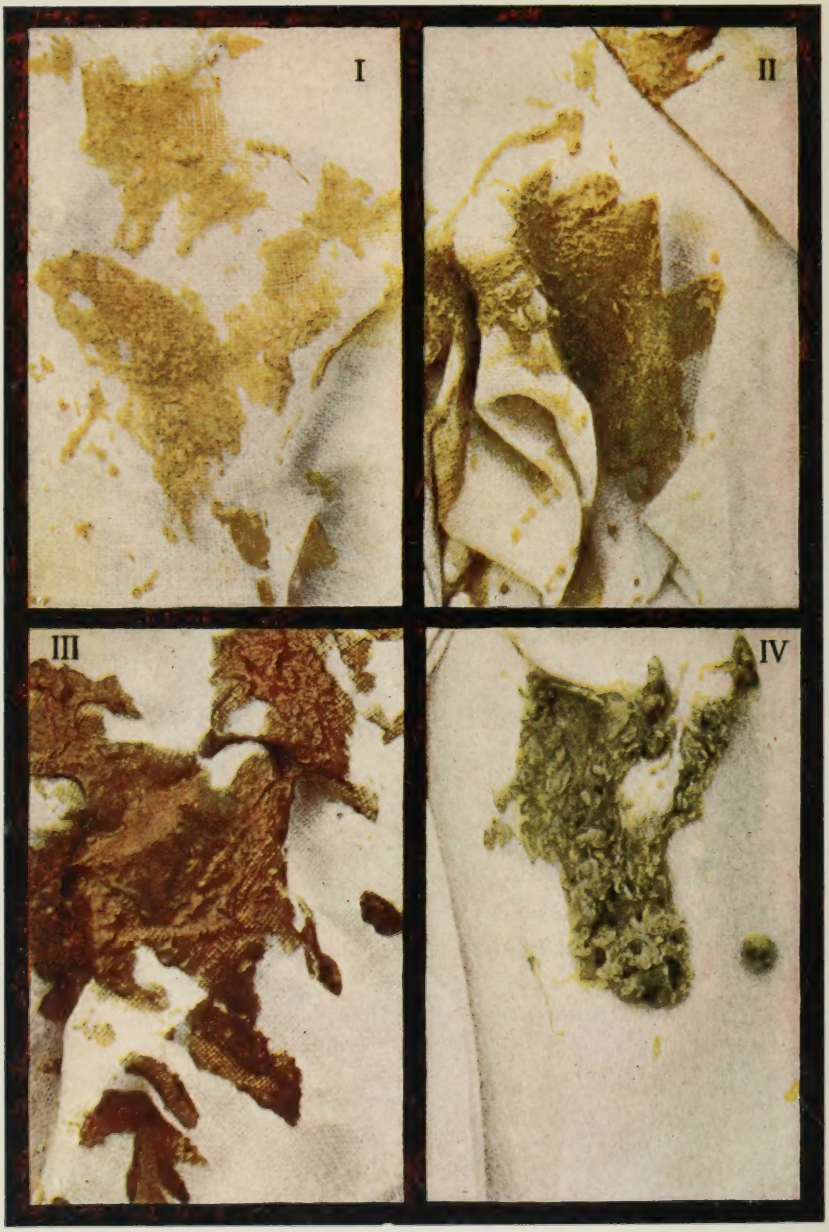

Stool of breast-fed infant. (Photographed direct from nature.) I and II, well-digested breast milk stool. III, discolored stool from a well-nourished breast-fed infant. IV, stool with undigested fat and fatty acid particles from a well-nourished breast-fed infant.

INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

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BY LEADING MEMBERS OF THE MEDICAL PROFESSION THROUGHOUT THE WORLD

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VOLUME I. THIRTY-SECOND SERIES, 1922

PHILADELPHIA AND LONDON

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Clinics

THE TREATMENT OF RHEUMATIC FEVER

By THOMAS McCRAE, M.D.

Professor of Medicine, The Jefferson Medical College, Philadelphia

This disease does not occupy a high place in the mortality returns, but its power to cause permanent damage should make us regard it as a most serious scourge. When we realize how many wrecked lives result from rheumatic fever the importance of doing all in our power to prevent cardiac damage is evident both from an economic and humanitarian aspect. It is unfortunate that so much attention has been given to the arthritis of rheumatic fever in the discussion of the clinical features and in treatment. Beyond the pain endured by the patient the arthritis has no significance. It does not result in any damage to the joint and is a temporary matter. A year from now it will not matter to the patient whether he had painful joints for two or six days in this attack, but it will mean much whether he is left with a damaged heart. This does not mean that we are to make light of the pain due to the arthritis, far from it, but we should not direct our attention too much to the very evident arthritis and forget other less evident conditions. That is why the designation acute articular rheumatism for the disease seems an unfortunate one. It lays emphasis on the arthritis, which is an unimportant part of the picture, and suggests that the arthritis is an essential feature which it is not. In children there may be little or no arthritis, but there is always myocarditis and often endocarditis.

What then is the important lesion in rheumatic fever if it is not the arthritis? This question can be answered by giving the opinion of one who said that the only invariable sign of rheumatic fever was dilatation of the heart. This may be somewhat of an exaggeration, but it is a useful one, and therefore excusable if it brings home the truth of the fact that the most important lesion in rheumatic fever is in the myocardium. Keep this always before you in treating patients with this disease—attention to the heart is your first duty.

You may ask: What of endocarditis and pericarditis? They are important factors and in certain cases may be the most important ones, but in a series of cases I believe the myocardium is first. In any case they cannot be separated, for endocarditis or pericarditis means myocarditis as well.

Let us study the problem as shown in two patients, the first being an adult and the second a child.

Case I.—*Rheumatic Fever in an Adult.*—This patient, a white male, is aged twenty-five years and comes complaining of swollen and painful joints. His past history is negative; there is no history of any previous illness similar to this. The onset was five days before admission without any previous history of tonsillitis. He began to have pain in the knee-joints, which became swollen, red and very painful. Other joints were involved subsequently and the arthritis in the knee-joints has cleared. The temperature has been between 103° and 104° and he has had drenching sweats. As you see he looks ill and seems very miserable. Several joints are swollen and red and he dreads any movement or handling of the joints. The heart action is rapid and a rather widespread impulse is visible. On percussion there appears to be some increase in dulness especially to the right. The sounds are well heard everywhere and while the first sound has rather a soft quality there is no definite murmur. We may sum up the diagnosis as rheumatic fever with myocarditis and some dilatation, but so far no evidence of endocarditis or pericarditis.

What is the problem of treatment? We have an acute general infection in which there is a particular tendency to involvement of the heart, more especially of the muscle. As you know certain lesions have been described in the myocardium which are thought to be characteristic of rheumatic fever. Can we shorten the period of acute illness? We have no specific treatment, but there seems reason to suppose that we can influence the course. The main effort should be to lessen the extent of cardiac damage and endeavor to bring the heart back to as nearly a normal state as possible. In this latter problem never forget the influence of age. The older the patient the less chance, other things being equal, of serious cardiac damage. As regards endocarditis, the odds are against this patient having it. The special features concerned with this problem will be discussed in connection with a younger patient. Let us take up the various points in detail.

Rest.—This comes first and in his present condition there is no difficulty in securing it, for he is unable to make much movement. Do all you can for his comfort as well. See that he is warmly covered, kept between blankets and wears flannel or warm pajamas. Care ought to be taken to avoid chilling. As the hospital arrangement of bed clothes prevents the shoulders being covered, see that he has a special wrap around the shoulders.

Diet.—This should be principally milk with fruit juices and cereals, or simple soft foods if he desires them. Avoid broths and beef-tea, for they seem to be harmful in some cases. Water should be given freely and the urine brought up to 3000 to 5000 c.c. each day if possible, unless the state of the heart contraindicates this large amount of fluid.

Bowels.—Keep them freely open. An initial purge by blue mass (0.6 gm.; 10 gr.) followed by a saline is useful and subsequently salines can be given each morning if necessary. Rochelle salts, a Seidlitz powder and magnesium citrate are most useful for this purpose.

Alkalies.—This seems to me the most important form of drug treatment. The urine should be made alkaline and then enough alkali given to keep it so. This patient required considerable amounts to make the urine alkaline. He was given potassium acetate and sodium bicarbonate in large doses every two hours for two days before the urine became alkaline. It is a good rule to take the reaction of each specimen of urine and increase the alkali if it is acid.

Salicylates.—What do these accomplish? Do they shorten the attack or only relieve pain? Much as I should like to believe the former, it seems doubtful. They do seem to accomplish the latter. In what dosage should they be given? Our British confrères have suggested that many of us on this side of the water do not know how to give them properly—that we do not use sufficient dosage. In this they are probably right. The dose should be at least 8 grams (gr. 120) in the twenty-four hours, and larger amounts may often be given with advantage. There may be difficulty with the stomach and to lessen this addition of tincture of capsicum is often helpful. Let me suggest another way of avoiding this, namely, to give the drug by rectum. From one to two drams (4 to 8 gm.) or even more can be given by rectum twice a day. This patient has taken full dosage

by mouth and in addition 4 gm. (gr. 60) once or twice a day by rectum with great benefit. The fear, sometimes expressed, that there may be depression of the heart does not seem to be justified.

There is another method of administration with which I have not had any experience, namely, intravenously. The sodium salicylate is given in doses of 0.25 to 2 grams in a 25 per cent. solution. This method is employed in severe attacks. Intravenous medication is not without dangers and my feeling is not favorable to this method in rheumatic fever.

The other salicylate preparations do not seem to have the same value as the sodium salicylate. After the acute arthritis has subsided the methyl salicylate may be used in 20 drop doses. From other drugs such as cinchophen (atophan) I have never seen any special benefit.

Local Measures.—These are directed to the relief of pain and the most efficient for the patient should be chosen. Fixation is advisable if the pain is very severe. Local applications of heat or cold may be used, the choice being governed by the result. A most useful application is methyl salicylate which may be applied on flannel. Some patients obtain more relief from the use of a saturated solution of magnesium sulphate, others from the lead and opium lotion. Active counter-irritation by the use of the Paquelin cautery or a mustard plaster sometimes gives relief. In the knee-joint, if there is much effusion, tapping is useful, 25 or 30 c.c. of fluid being withdrawn, to be repeated if necessary. This may give great temporary relief.

Sedatives.—In some cases the pain is so severe that morphia may be required. Its use is sometimes followed by general malaise so marked that I have known patients, who had previous attacks in which morphia had been given, request that it not be used if possible, as they preferred to bear the pain in preference to the depression which resulted from morphia.

Foreign Protein.—This has been given intravenously and good results are reported by careful observers. Typhoid bacilli may be injected in doses of fifty million at first. A brisk reaction is necessary if benefit is to result. I have never used this treatment in rheumatic fever and so cannot speak of it from personal observation. There does not seem any reason to expect that it lessens the danger of damage to the heart, unless it is proved to shorten the duration of the infection.

As endocarditis is usually present before the patient comes under observation, even this would not reduce its incidence to any extent.

CASE II.—*Rheumatic Fever in a Child.*—This boy is twelve years of age. He has never been strong and for some years had occasional attacks of tonsillitis for which his tonsils were removed two years ago. His present illness followed exposure to cold and wet. He had slight fever for a few days with arthritis of a very mild grade. The joints were not red, only slightly painful and with very little swelling. The general condition is excellent. The heart shows a forcible impulse without any shock or thrill, some increase in dulness to the left and quite marked increase to the right. At the apex the first sound is heard followed by a systolic murmur not carried out beyond the mid-axilla. The murmur is loudest over the body of the heart. The sounds are clear in the aortic area; there is a systolic murmur heard in the pulmonic area to which we attach no importance. The pulse is 96, regular and of good volume.

DR. MCCRAE: Mr. A., what is your opinion of the condition of the heart?

STUDENT: The patient has mitral insufficiency.

DR. MCCRAE: Yes, we would probably all agree on that, but can you go any farther in the diagnosis? What is the condition of the mitral valve?

STUDENT: There is an acute endocarditis.

DR. MCCRAE: There may be, but is there any other explanation as to the cause of the murmur? In this connection keep in mind what was said earlier regarding the frequency of involvement of the myocardium. Could myocardial change be responsible for the murmur?

STUDENT: Yes, if it resulted in dilatation.

DR. MCCRAE: Exactly, and if you will study the signs you will see that a relative insufficiency of the mitral valve secondary to dilatation can explain the signs. It is almost impossible to-day to speak with certainty as to the exact diagnosis of endocarditis. Luckily as regards treatment this does not matter. It is the same whether he has or has not an endocarditis. Our problem is to try to bring the heart muscle back to normal or as near that as is possible. Let us take up the measures that are of value.

Rest.—This is our principal measure, simple of course and hence

all the more difficult to carry out. The average man is not impressed by simple remedies unless he has more than the usual share of sense and you will find rest a difficult prescription in many cases. In this case the parents are sensible and promise to do all they can to co-operate. What is the reason for rest? It gives the heart muscle the best chance to return to normal and lessens the chances of endocarditis if this is not already present. Time is necessary with as light a load as possible for the heart muscle. The heart rate with this boy at rest and up and about differs by about 30 beats a minute. That means 1800 per hour and you can calculate the number for a day and a week. Rest saves the heart this harmful overwork. How long should rest be given? This is difficult to state—at least three months, better six months, and perhaps one to two years. Evidently this cannot be carried out in many cases.

Digitalis.—Should this be given? The answer depends largely on your view as to what digitalis can do. My feeling is that at present he is better without it, but later if the dilatation persists we may decide to try it. You have seen another patient much like this one in whom digitalis seemed to cause a rapid decrease in the dilatation.

Other Drugs.—The urine was strongly acid on admission and he has been taking potassium acetate so that now the urine is alkaline. We shall try to keep it so as long as any acute features persist; there seems no need for giving salicylate. The arthritis is slight and he has hardly any pain. For the same reason local measures are not needed.

Anæmia.—Always remember that there are few diseases in which red blood-cells are more rapidly destroyed than in rheumatic fever, and anæmia is always present after an attack. In this patient the red cell count is 3,500,000 per cm. and as soon as the acute features are over it will be well to give him iron and arsenic in the form of Blaud's mass 0.3 gm. (gr. v) and arsenious acid, 0.0016 gm. (gr. 1/40).

The patient was seen again after six weeks. His general condition showed much improvement, the blood-count is over 4,500,000 red cells per cm., there is no arthritis and the boy feels well. The heart condition is as follows: The action is quiet, the apex beat is not displaced, the dulness seems to be practically normal, certainly the increase to the right has disappeared, and the murmur is not nearly so loud as before. There is still a murmur at the apex, but

it is not transmitted. The diagnosis of endocarditis is not yet excluded, but the course is strongly suggestive of dilatation due to myocarditis and there is good reason to hope that there will be still more improvement.

You will remember the question as to the wisdom of giving digitalis was asked. The dilatation of the heart did not alter materially and it seemed well to try the effect of digitalis. This was given as the tincture in doses of 10 minims (0.6 c.c.) three times a day. Following this there was a definite decrease in the size of the heart in a few days and I am inclined to the view that the digitalis was of value. At the same time the systolic murmur became less evident and the pulse rate gradually fell to 80, at which figure it has remained. There is still some increase in the cardiac dulness and we mean to keep the patient at rest for some time yet.

In this patient the arthritis was nothing, the cardiac lesion everything. We are as yet uncertain as to how much permanent damage his heart has sustained, but we hope the muscle may be restored to normal. Let me emphasize again that the chief object of treatment in rheumatic fever is to bring the patient through the attack with as sound a heart as possible. Do not let the insistent arthritis, if present, take your attention away from the more important heart condition.

PERNICIOUS ANÆMIA*

By HENRY A. CHRISTIAN, M.D.

Boston, Mass.

THIS patient (P. B. B. H., Med. No. 16,086) I brought over to show you in contrast to the patients I have been showing recently, because it seems to me that the diagnosis in the group of cases represented by this patient is easy compared with the difficulties encountered in those recently shown. Curiously enough, however, it is one of a group of cases that are very frequently sent into the hospital incorrectly diagnosed, and that was true of this patient, and yet his condition is so typical that it does not seem to me that any of you would have had any trouble in making the diagnosis.

This man is a Russian, 48 years of age. Important points in his history are that he has had a certain amount of abdominal distress; he has had constipation and he has had abdominal pain during the last months. The pain in the abdomen radiates to both sides of the abdomen and along the costal margin, but remains confined to the abdomen. At first this pain came on about one-half hour after meals, lasted from one-half to one hour and then disappeared to recur in two or three hours. It was not relieved by taking food. There has been no vomiting and the stools have not been tarry. For the past three months the pain has been constant, though less severe, and present at night as well as during the day.

This part of the history which I have just narrated is the misleading portion and a mistake in diagnosis in this case was probably made from the fact that the above was as much history as was obtained by the physician who had him under observation. That history clearly points to a gastrointestinal disturbance.

Now, if you saw his man with his appearance of pallor and had only the history as given above, probably you would say that he had a gastrointestinal neoplasm. However, there are other features in his history that are striking, and if you had obtained the full history,

* A clinic given to students of the Harvard Medical School.

I do not see any excuse for not making the correct diagnosis. These other features are that he has been gradually losing his appetite, gradually losing his strength and his tongue has been sore for several months. Seven months ago, and that is about the time that he names as the onset of his gastrointestinal disturbance, he began to have tingling and needle-like pain in his fingers. For the last few months he has complained of being cold for most of the time. He has lost about twenty pounds in weight since the onset of his illness. To summarize, you have in his history a striking combination of gastrointestinal disturbance, loss of strength and appetite, moderate loss of weight, pallor, sore tongue and sensations of tingling and needle-like pains in his fingers. What does that combination of symptoms suggest?

STUDENT: Pernicious anæmia.

Apparently you recognize the combination, and yet I want to impress on you that the practitioner who graduated ten years ago or more, for some reason or other, has not succeeded in recognizing that as a very typical, common combination of symptoms which point strikingly to a primary anæmia. Occasionally you are going to get such a history and not find that it is primary anæmia, but primary anæmia is the thing to think of on hearing such a story.

I think there are two things that mislead one in the diagnosis. The first is that the patient complains primarily and chiefly of his gastrointestinal symptoms. So often in taking a history one merely accepts the patient's story and does not amplify it by intelligent questions that he only gets a part of the story. The patient knows about other disturbances, but does not consider them really of importance and he fails to tell them unless questioned about them, and so the history that is obtained is an incomplete one. I think another reason for making an incorrect diagnosis so often is undue attention paid to the blood picture which is regarded as typical of primary anæmia rather than giving due attention to the various complaints and other disturbances found in the examination of the patient. It does not seem to me that pernicious anæmia should be considered as a blood disease, but as a general disease in which the blood and blood-forming organs, among other tissues, are involved. If you study your cases carefully you do not find a lesion any more frequently in the blood-forming apparatus and in the blood than is found in other structures of the body.

You practically always find evidence of a lesion in the central nervous system, and even in those cases where you get no symptoms or physical signs, anatomical study has shown that there is a certain amount of sclerosis, patchy in distribution, in the cord and in the brain, and such is found in practically all cases of pernicious anæmia. In pernicious anæmia ordinarily disturbances in the central nervous system are manifested more by symptoms than by physical signs. The patients complain of tingling and numbness in their hands and feet and in many of the patients you cannot find any evidences of central nervous system disturbance beyond this; in such cases the reflexes are normal.

The patients who show other changes than these simple sensory disturbances roughly may be divided into two groups according to the disturbances made out in their reflexes. There is one group, a relatively small one, in which reflexes are exaggerated, who often have ankle clonus and patellar clonus with spasticity of the muscles, and who occasionally have such marked degree of spasticity in the legs that they develop a cross-legged progression and the legs become extremely spastic and painful. The other group, and this is more commonly seen, have decreased reflexes, particularly the knee-jerks, and in some of these you get instability in gait and in position up to a typical positive Romberg sign. In the first group the areas of sclerosis involve chiefly the pyramidal tracts of the cord; in the latter, chiefly the posterior columns. A few patients have definite psychoses and are sent to institutions for the insane. It is interesting that the sensory disturbances nearly always develop first in the fingers and appear later in the toes. It is rare, however, for these more marked changes with involvement of the reflexes to be found in the hands and arms. In other words, though evidences of central nervous system disease appear earliest in the upper extremity, if they progress to more extensive changes the progression usually takes place in the lower extremity. The earlier appearance of the sensory symptoms in the upper extremity, however, may be merely due to the fact that the normal sensitivity of the fingers is greater and their manipulations are more delicate and consequently slighter sensory disturbances that are not appreciated in the feet are recognized in the hands.

In practically all cases of pernicious anæmia the gastrointestinal tract is involved. These patients nearly always have some symptoms

from the gastrointestinal tract. In some cases the symptoms are very slight, though even here there is usually a moderate degree of loss of appetite associated with some slight gastric distress. The symptoms range from these slight ones to severe persisting gastric pain, and as far as the intestine is concerned, you may have severe diarrhœa, you may have constipation or you may have a combination of the two—diarrhœa alternating with constipation. The diarrhœa may be related to dietary indiscretions and represent an increased sensitivity of the intestine so that food which a normal person would digest without disturbance produces a diarrhœa or it may be independent of diet. Not infrequently the patients have daily a few soft, bulky stools and this results from their low gastric acidity.

The gastric symptoms may be present pretty constantly or may appear only at a varying time following a meal. Sometimes the symptoms very strongly suggest gastric ulcer, at other times gastric carcinoma. Occasionally there is an extreme degree of gastric pain, which sometimes is somewhat relieved by food, at other times aggravated.

I think it should be recognized that it is not the occurrence of any particular form of gastrointestinal disturbance that is suggestive of pernicious anæmia, but that it is important to realize that most cases of pernicious anæmia have some gastrointestinal disturbance and these gastrointestinal disturbances form a definite part of the picture of pernicious anæmia.

In examining these patients for evidences of gastrointestinal disturbances very commonly you find changes in the tongue. The patients complain of a sore tongue and often it appears red and inflamed, particularly along the margins. In such a tongue superficial, so-called aphthous, ulcerations are frequently seen. This is a varying condition and the condition will appear, get well and reappear in succession over a long period of time. After this has continued for some time inspection will show that a progressive atrophy of the mucous membrane of the tongue has been taking place and this continues until finally in many patients the tongue is smooth, pale and glossy. With these objective findings the patients often complain that their tongue is sensitive and very often it is sensitive to particular foods, as for example, acids cause great distress, or salt irritates. In the later stages of the anæmia, as a rule, the sensitivity

of the tongue decreases and you have merely the atrophic tongue already described.

Gastric analysis in cases of pernicious anæmia with very few exceptions shows insufficient secretion and abscence of hydrochloric acid and decreased total acidity. This may be found before there is any evidence of anæmia. Occasionally you find a considerable amount of mucus. Often the stomach bleeds easily and the trauma of the stomach tube causes sufficient oozing to give positive benzidine tests. It is important to realize this in order not to draw the conclusion from the finding of blood that you are dealing with an ulcerated neoplasm. As far as the intestine is concerned there is little or no evidence on examination of the stools of any lesion. In some of the cases of diarrhœa mucus, pus cells and a moderate number of red cells are found.

A third thing to recognize as a characteristic part of the disease is the presence of fever, particularly when the blood-count is low. Sometimes the fever is a fairly high one and occasionally these patients are regarded as having an infection. We have seen pernicious anæmia diagnosed on account of fever and other appearances both as typhoid and as acute vegetative endocarditis.

Finally, the general appearance of the patient is quite characteristic. The combination of pallor with a characteristic, lemon-yellow tinting of the skin is striking. Often the scleræ are pearly white in contrast to the lemon-yellow skin. Sometimes the pigmentation, however, involves also the scleræ.

In regard to the blood itself, I think we should regard the occurrence of anæmia as of more importance than any single peculiarity of the blood. If the patient presents these various features and is anæmic it is pretty safe to make the diagnosis of pernicious anæmia even though the blood picture is quite removed from that regarded as typical of primary anæmia.

Not infrequently the liver and spleen are enlarged in primary anæmia, but almost as often these changes are lacking. Quite frequently the heart shows a moderate hypertrophy and at autopsy the heart usually weighs more than the normal. However, circulatory symptoms are unusual except in extreme degrees of anæmia when there is a rapid pulse, breathlessness and sometimes œdema, appar-

ently from the lack of red corpuscles rather than from any disturbance in the circulatory apparatus.

From the point of view of diagnosis the cases with extensive central nervous lesions and slight anæmia are of special importance. Some neurologists go so far as to believe that all cases with the lesions indicative of a lateral or combined sclerosis in which you can exclude syphilis are actually cases of pernicious anæmia, and if the blood does not show anæmia, they are at a stage in which the anæmia has not developed. From their point of view, if they live long enough they will show the quite typical blood picture of a pernicious anæmia, but they may die before this develops.

That we do quite frequently encounter patients with early evidence of central nervous system lesion, and sometimes with evidence of a marked lesion, in which the anæmia is very slight, strongly suggests that we are dealing with a general process and not merely with a specific blood disease. The same thing applies to those cases in which gastric anacidity and gastrointestinal symptoms have been observed many months or even years before the development of any evidence of anæmia.

What do we know about the etiology of pernicious anæmia? I do not think that we know anything. We have a great many theories, but when you boil them down we really have very few definite facts. There is much in the disease that suggests a chronic infection with the results of the infection expressed in various parts of the body, but we have no real evidence of the nature of this infection, and the entire question of etiology is an unsolved one.

How are we going to treat a patient with pernicious anæmia? We apply general hygienic methods, with particular attention to the patient's nutrition, pushing his diet, using fresh air, etc. In a certain number of cases giving hydrochloric acid improves gastric digestion, checks diarrhœa and the patient begins to improve. Iron and arsenic in their various forms have had extensive use. The general consensus of opinion seems to be that arsenic is more effective than iron. Periodically various forms of subcutaneous and intravenous treatments with iron and arsenic are enthusiastically advised. Critical examination of the results suggests that neither iron nor arsenic are of much actual use in these cases.

A short period ago there was a tremendous amount of enthusiasm

about splenectomy. At present there seems to be a growing consensus of opinion that splenectomy occasionally produces a remission when prior to the splenectomy there had been no remission, and that possibly it had been a determining factor in producing the remission. Beyond this, few at present make any claim and splenectomy is relatively little used.

In just the same way there has been great enthusiasm in regard to transfusion in these cases. Blood transfusion undoubtedly temporarily replaces a blood deficit and so temporarily improves the patient. It is now recognized that the life of the red blood corpuscles transfused into the pernicious anæmia case is considerably longer than we had previously thought. Evidence of the presence of the transfused corpuscles in considerable number can be found from 90 to 100 days after the transfusion. From this it seems rational to believe that the transfused blood will persist for some time, and as these corpuscles remain in the circulation, they probably function to benefit the patient. In a certain number of cases it seems as if transfusion starts a new cycle of activity in blood formation on the part of the recipient and so institutes a definite remission. However, a final analysis of transfused patients indicates that the length of life in these patients is probably not much greater than in patients not receiving transfusions. Transfusions, however, remain our best means of temporarily meeting the situation and they should be advised as a means of treating pernicious anæmia even though we recognize the limitations of the method and grant that they are in no sense curative.

The theory that pernicious anæmia is due to an infection, already mentioned, has stimulated the search for and the removal of focal infections in these patients. If there is a definite focus of infection there is but little question that it is damaging to the patient with pernicious anæmia and so should be eradicated. However, it is extremely doubtful whether foci of infection play any real part in the mechanism of the disease and consequently it is not probable that their removal will have anything more than a slight effect on the general course of the disease. It is to be recognized that up to the present time no method has been devised which is in any sense curative of pernicious anæmia.

A CARDIOLOGIC AND SOCIOLOGIC EXPERIMENT IN THE TREATMENT OF HEART DISEASE*

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THE cardiologic end of the experiment is to give a complete examination to all those who may apply. The sociologic innovation consists in making those who enjoy the benefits of the examination pay for the cost of the service. The great value of a complete cardiologic examination of every patient has been impressed on me by an intensive experience of five years in private practice.

The examination involves a complete record of the subjective symptoms, a general physical examination, a fluoroscopic study of the heart, and orthodiagram by the X-ray method, an electrocardiogram, a polygram with the MacKenzie polygraph, a Wassermann test, a blood-count and urinalysis. This examination has revealed important and unsuspected facts in people who previously have been under observation for a long time. Many instances can be cited, but the most notable ones have been in cases of cardiac discomfort of long standing. This discomfort has sometimes proved to be due to an unsuspected specific infection or a bundle branch lesion. These people had been told frequently that their trouble was indigestion. One man, notably, with a bundle branch lesion was under treatment in a hospital for many weeks for supposed gastric ulcer.

Many practitioners who have had no experience with the complete cardiologic examination still believe that it is too expensive and troublesome to be applied to all cardiac sufferers. We are so impressed with its value and importance that it seemed worth while to find out by practical observation whether the profession and the public really would value the opportunities for the use of modern cardiologic methods if the element of supposed excessive expense were removed. It was felt that if the service were given free it would be utterly impossible to judge whether the profession or the public put any

* Read before the meeting of the Amer. Therapeutic Society, Baltimore, Md., Feb. 26, 1921.

value on it or not. It certainly would be an economic crime to give this service without a charge to all comers.

The opportunity was offered at the Good Samaritan Dispensary of establishing a heart and tension clinic along hard and fast lines, such as would be necessary for a real test of the matter. About $5000, partly advanced by the institution and partly by private persons, was spent in establishing and equipping the department. A charge of $25.00 has been determined as necessary to cover the running expenses, and, if the clinic proved a success, to pay for the equipment. The clinic was opened a few months ago and received some notice in the public press. The experience of the first few weeks was interesting and we here describe the first ten patients.

We hope to make this clinic a place for the productive study of heart and tension conditions. It was decided at first that the cases would be studied seriatim because the problems of cardiology which are most important are those which pertain to the average sufferer and not to the extraordinary or so-called interesting cases. These people came, many of them, because they knew from their own consciousness that there was something the matter with their hearts and they wished the matter confirmed by definite investigation.

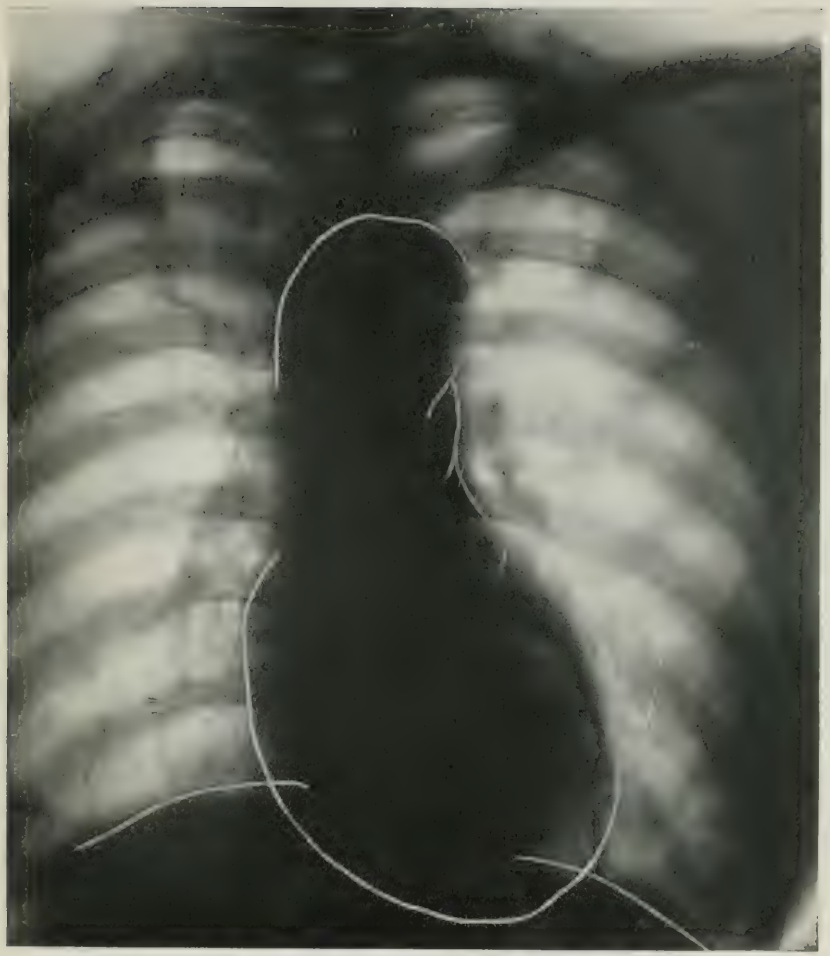
One of the great drawbacks to the prevention of heart disease at the present time is that nearly everyone considers it his duty to persuade a person complaining of heart discomfort that there is nothing the matter with him. One, at least, of these persons expressed great gratitude and appreciation because he at last found a place where he could be examined and a true appraisement of his trouble made.

The first ten people who applied were as follows:

Case I.—Mrs. L., a woman 45 years of age, had complained of pain under the breast bone in the left chest for two years. She also complained of consciousness of the heart beat and ringing in the ears at night. She had been classified as a neurasthenic and so treated in many institutions. The particular advice which she seemed to have received was that she should rest a good deal, be built up by tonics and try to forget her cardiac discomfort. The pain was increased by exertion. It radiated down the left arm, but rather to the thumb than the little finger.

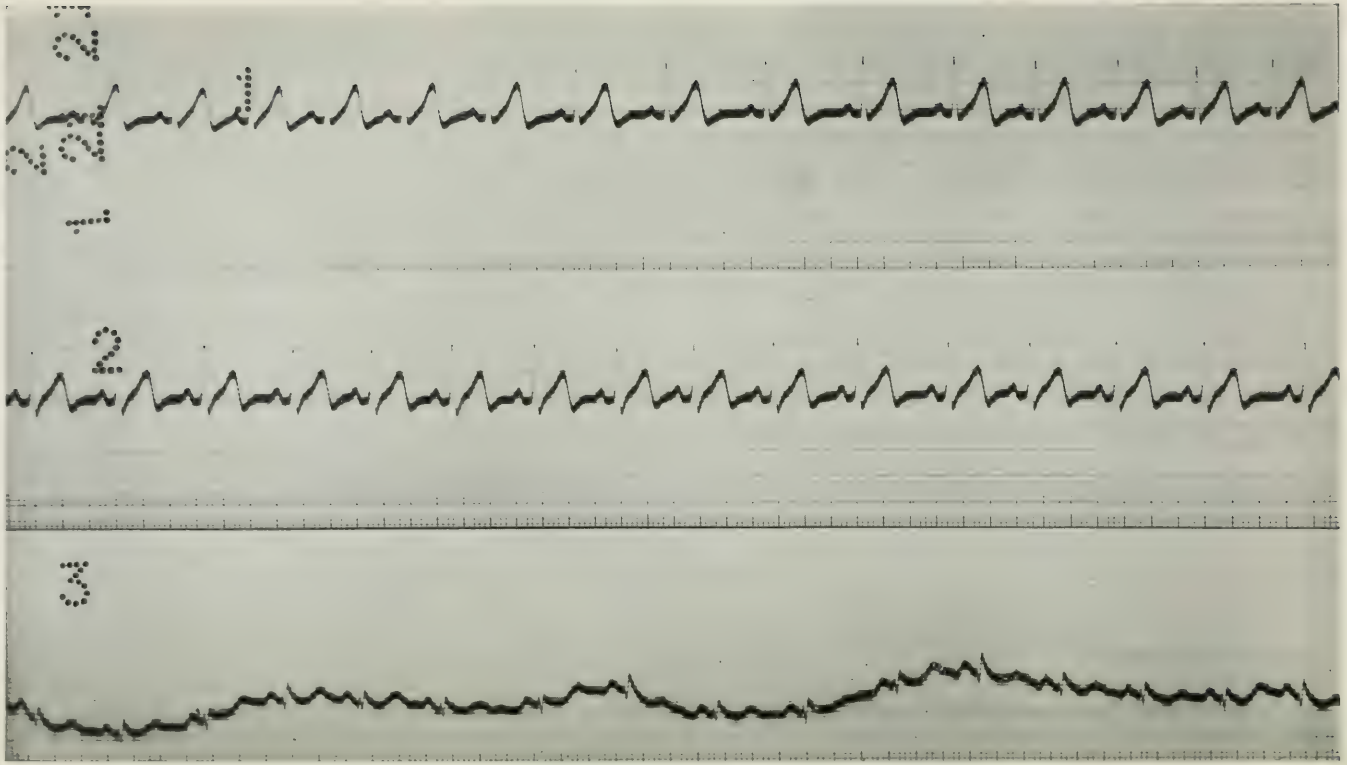
Physical examination revealed no cardiac enlargement and no

Fig. 1.



Orthodiagram of Case I.

Fig. 3.



Electrocardiogram of Case II.

murmurs. The orthodiagram showed a heart of normal outline with some increase in the aortic shadow such as might have been accounted for in a measure by an increased intra-aortic pressure. The electrocardiogram and polygram showed a normal heart of left preponderance with recurrent ventricular premature beats. The urinalysis gave the picture of sluggish metabolism, fairly high gravity, many urates, faint sugar reaction, a few hyaline casts and a trace of albumin. The blood showed a high red cell count with relatively poor hemoglobin, in other words, the thick pale blood of early arteriosclerosis. The blood-pressure was 140/80. The case, therefore, sums itself up into the case of a middle-aged woman of plethoric habit, sedentary life, subjected to overingestion of food, who has developed cardiac discomfort, premature ventricular contractions and some irritation of the kidneys. The case is essentially a cardiac case because of the cardiac pain, and was so accepted and classified. On the other hand, the heart was not the seat of permanent or organic change.

This case immediately raised the question as to what are cardiac cases and what are not; the precedent was established that everyone who has complained of cardiac discomfort of a persistent or recurrent nature is a cardiac case and deserving of analysis of the cardiovascular renal system and the underlying infections and disturbances of metabolism. The case is thus recognized as early arteriosclerosis due to disturbances of the metabolism.

The patient was put on the established treatment for this condition, namely serial doses of castor oil, a low protein diet, outdoor exercise, and the symptomatic use of nitro-glycerin to prevent pain when exercise is to be taken or relieved if caused by it. In a short time she was relieved of her discomfort.

Incidentally, it might be said that the same patient might have been treated from many other points of view, because her whole system was in an unhygienic condition, but as the unhygienic state of her heart muscle was that which gave the most prominent evidence, she happened to fall into a heart clinic.

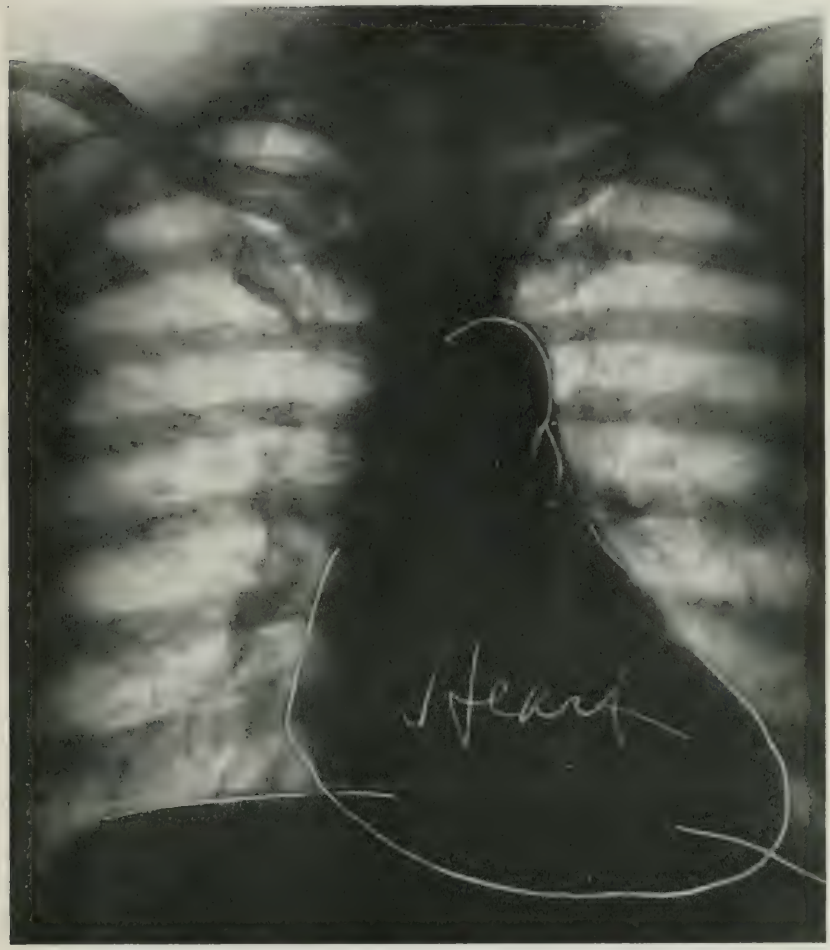
Case II.—The case of Master F., a child, presented a very common problem in the cardiology of children, namely, an estimation of the relative importance of organic change and attending physical disabilities in producing cardiologic symptoms. This child had no complaint, but had been told that he had a serious disease. The pharynx showed a chronic congestion; the teeth were in good con-

dition and the lungs were negative. The blood-pressure was 60/92. The heart area was enlarged to the left with a loud systolic murmur, heard best at the apex and transmitted to the left. The electrocardiogram indicated marked sinus arrhythmia. The orthodiagram was one of an enlarged heart of the mitral type. The blood examination gave 3,924,000 red blood cells. The urine contained a trace of albumin, abundant crystals of calcium oxalate and was strongly positive for indican.

It is possible that a child with profound anæmia, suffering from disturbances of the metabolism and the influence on the system of recent infection could have a dilatation of the heart sufficient to produce a bruit to the degree shown in this patient, and no doubt in this case much of the noise and general disturbance may be due to the general physical conditions. Nevertheless the degree of left-sided predominance shown in the orthodiagram and in the electrocardiogram would indicate that already there had begun a definite hypertrophy of the left ventricle which of course would not be expected in a purely functional condition. However, as the general clinical inspection led us to believe that the infection was no longer an active influence on the heart, the parents were told that the child might expect relief from the condition, though the murmur might persist, and were instructed that the child should not be invalidized, but should, under careful supervision, be allowed the liberties of the healthy child at such time as the blood and general condition were restored to normal.

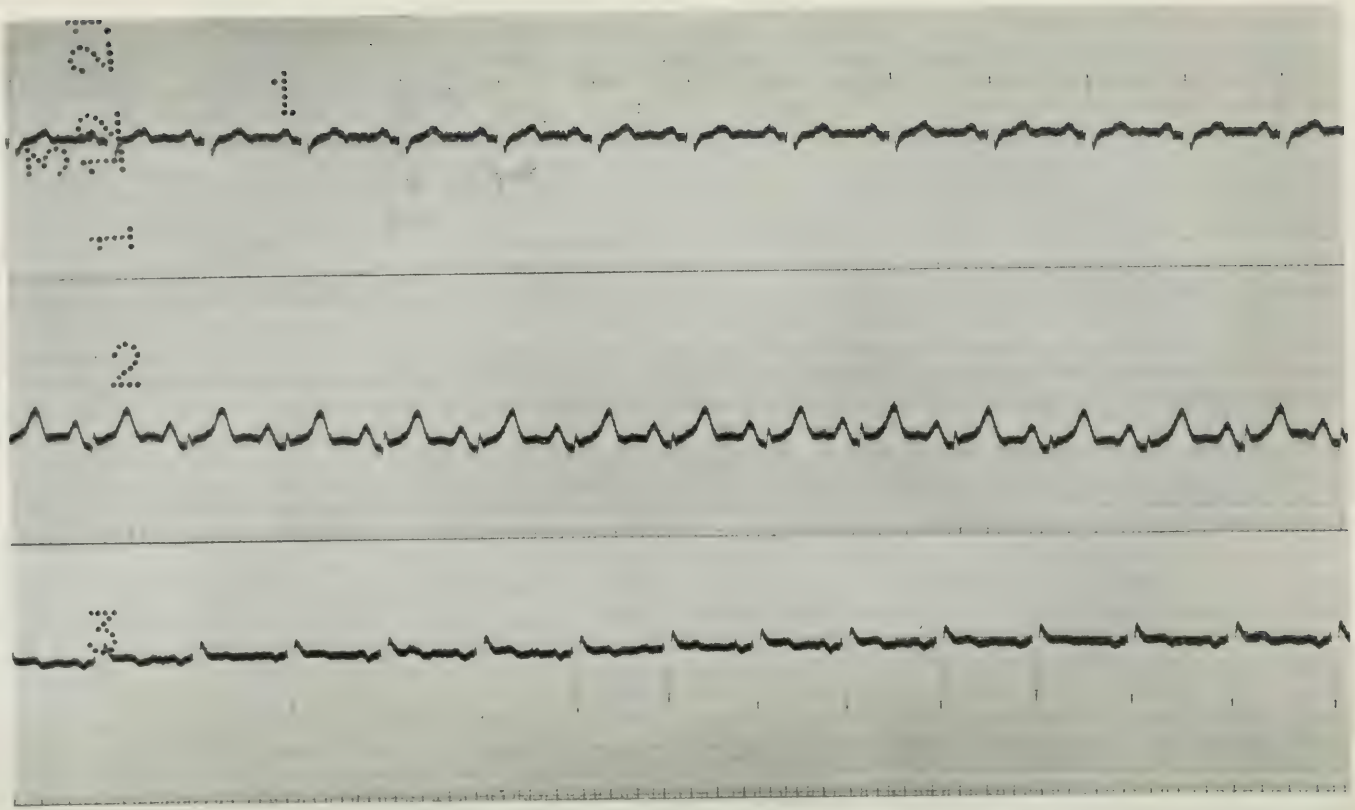
Case III.—Mrs. B. presented the picture of endocrinologic disturbance of the ovarian type with commencing arteriosclerosis. The question whether the impairment of the cardiac system was of sufficient degree to be more than should be expected of her age and history is of no importance. The definite complaint of cardiac pain would probably justly throw her into the classification of cardiovascular disease. However, this particular class of patients, containing as it does a vast number of women, is almost equally distributed over all departments of medicine. The neurologist and the gynecologist in former years divided those who were not taken care of by the general practitioner. In these days the endocrinologist and the cardiologist are taking care of their share of them. Nature made a mistake when it did not plan some way of suspension of the ovarian function without suffering.

Fig. 5.



Orthodiagram of Case III.

Fig. 6.

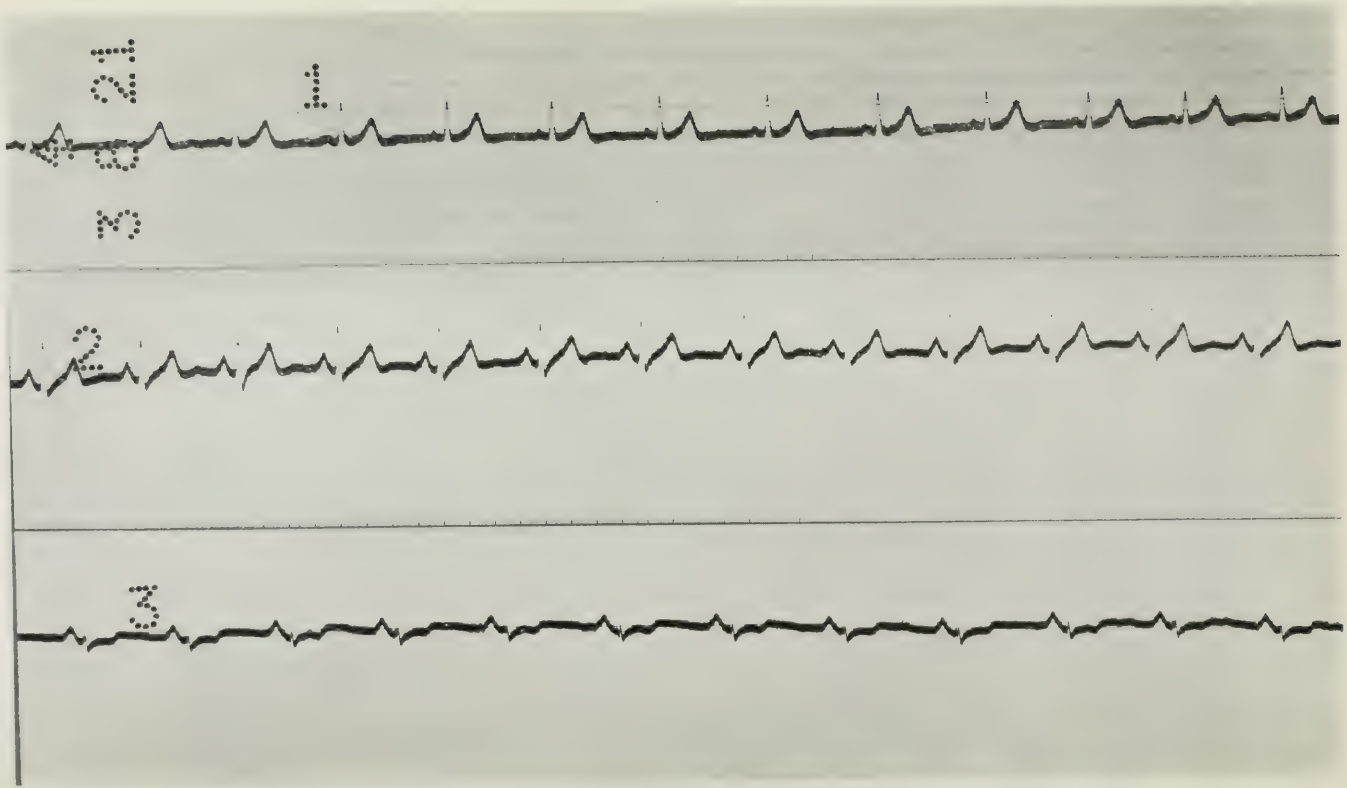


Electrocardiogram of Case III.

Fig. 7

Orthodiagram of Case IV.

FIG. 8.

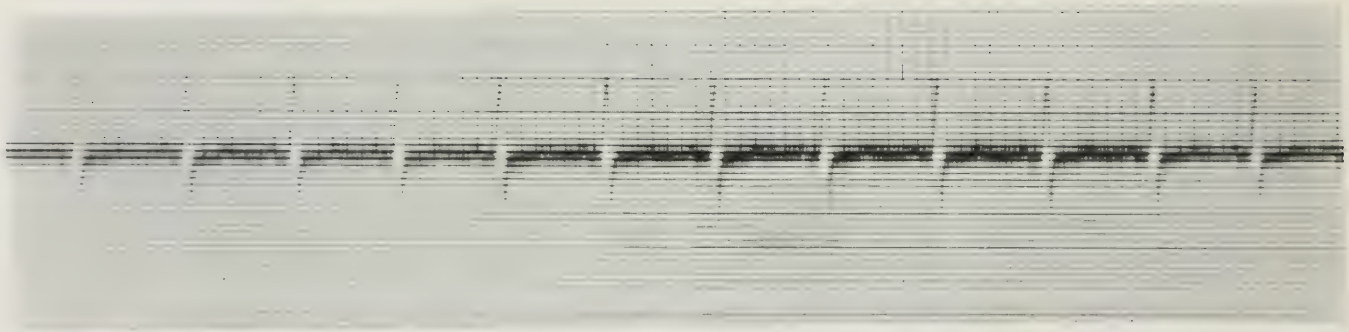


Electrocardiogram of Case IV.

Fig. 9.

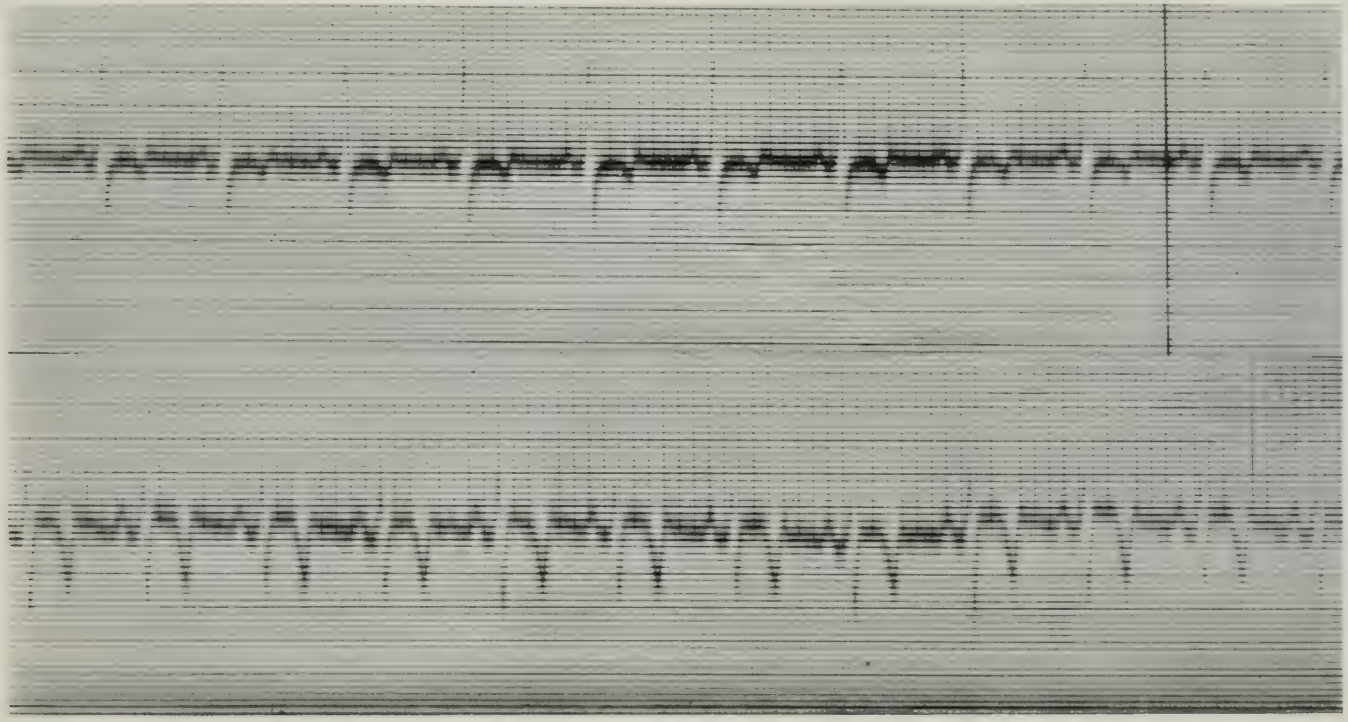
Orthodiagram of Case V.

Fig. 10*a*.



Electrocardiogram of Case V.

Fig. 10*b*.



Electrocardiogram of Case V.

It may be said that this patient showed a great deal of improvement on general hygienic treatment, particularly the insistence upon outdoor exercise and the removal of family worries. In justification of her treatment in a cardiac clinic was the fact that her major symptom was expressed through the heart muscle.

Her physical examination showed the throat and teeth to be in good condition; the lungs were negative; the heart area was not increased, and no murmurs were heard. The impulse, however, was violent, due to the excitement of examination. The abdomen was negative; the liver was neither enlarged nor tender. The extremities had no œdema. The pulse was regular, the rate 86. The blood-pressure was 123. The blood-count gave 4,072,000 erythrocytes, with 90 per cent. hemoglobin. The urinary findings were negative. The Wassermann reaction was negative. The orthodiagram approached the aortic type, while the electrocardiogram indicated a preponderance of the left ventricle.

This case is one of vaso-motor disturbance of the menopause with pain and dyspœnia, aggravated by her miscarriage.

Case IV.—The fourth patient was Mr. I., aged 38, who had been greatly worried because of a loss of 40 pounds in weight during the past year, together with palpitation and dyspnœa on exertion and attacks of faintness. With the exception of tonsillitis every year and an attack of neuritis in the right leg lasting for six months, he had had no illness, though for some years he had been rather nervous. His present weight is 120 pounds. On physical examination the left tonsil was found to be chronically enlarged. The heart was of normal size with sounds pure. The pulse was regular, the rate 76. The blood-pressure was 120/75. The thyroid was slightly enlarged and hard. The electrocardiogram indicated slight sinus arrhythmia. The orthodiagram showed a normal heart. The blood-count was 6,536,000 red cells with 90 per cent. hemoglobin. The urine had traces of albumin and was weakly positive for indican. The Wassermann reaction was negative.

Thus, the cardiologic findings were negative.

Case V.—Mr. S., aged 31, gave a history of rheumatic fever fifteen years ago. For the past ten years he has been conscious of some trouble with his heart. He has had dyspnœa on exertion and palpitation with throbbing in the neck. These symptoms were less annoying when he was moderately active.

On examination his heart was found to be considerably enlarged to the left and downward. The apical impact was violent and a loud diastolic murmur was heard all over the heart area. There was active pulsation in the carotids. The pulse was regular, rate 76, and of the water-hammer character. The blood-pressure was 160/30. The electrocardiogram had downward T waves in lead 2 and 3. The blood-count gave 5,208,000 erythrocytes and 90 per cent. hemoglobin. The Wassermann reaction was negative. There was a faint trace of albumin in the urine which was of high specific gravity, 1.033, with a slight increase of indican. The electrocardiogram gave evidence of a coronary lesion. The orthodiagram showed a heart of the aortic type.

The condition is an atypical one, mainly rheumatic carditis, following the specific type even to the partial occlusion of a coronary artery. This man did not remain under observation long. If he had, we would have tried specific treatment, as experience has shown that, even though not specific, this type of trouble is helped by iodide of potash.

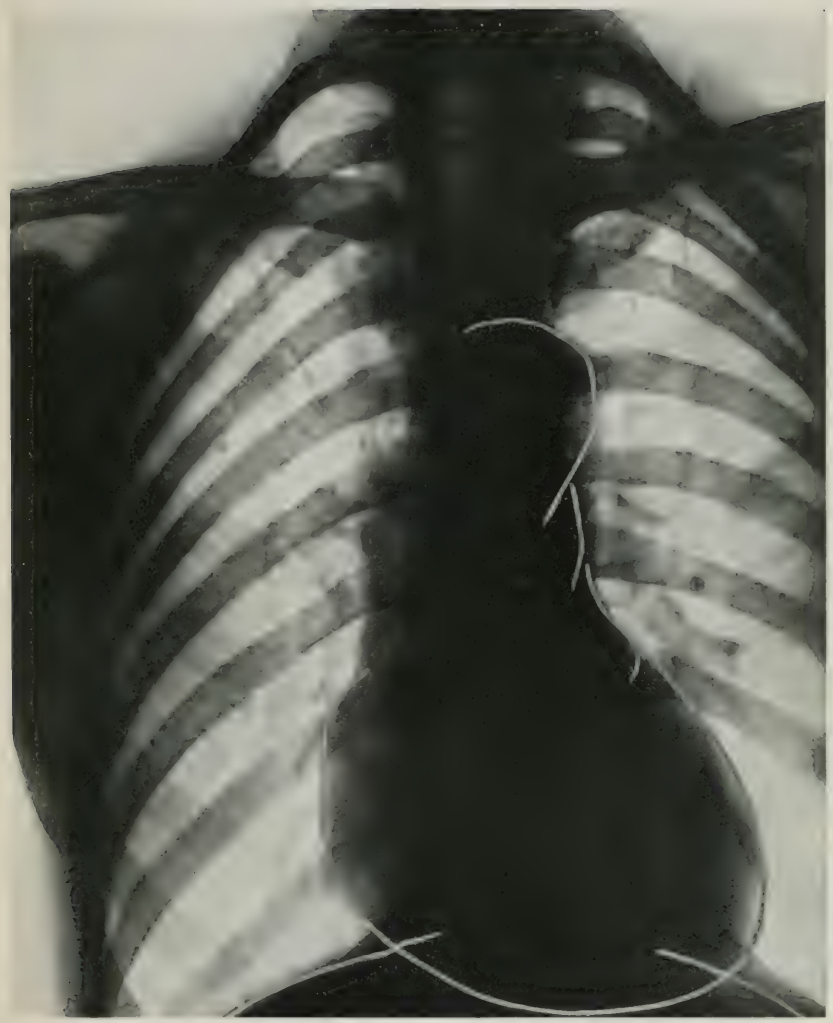
Case VI.—Mr. H., aged 46, had suffered for some years from pain in the left chest, especially after fast walking, and with dyspnœa on exertion. He had had considerable bronchitis, frequent sore throats, occasional frontal headaches and poor appetite.

On physical examination his teeth were found to be in bad condition and the tonsils were chronicly inflamed. The heart area was enlarged to the left and there was a soft systolic blow at the aortic area and also slight tricuspid and mitral presystolic roughening. Respirations were shallow and there were some faint râles at the left apex of the lung. The pulse was regular, rate 92. The arteries were wiry, the blood-pressure 130/90. The urine showed no abnormality. The red blood-count was 6,336,000 with 75 per cent. hemoglobin. The Wassermann reaction was negative. The electrocardiogram indicated a marked left preponderance. The orthodiagram showed an approximately normal heart.

This case was an example of arteriosclerosis. The patient improved under the usual treatment and advice, comprising castor oil, nitro-glycerin and the "few protein" diet.

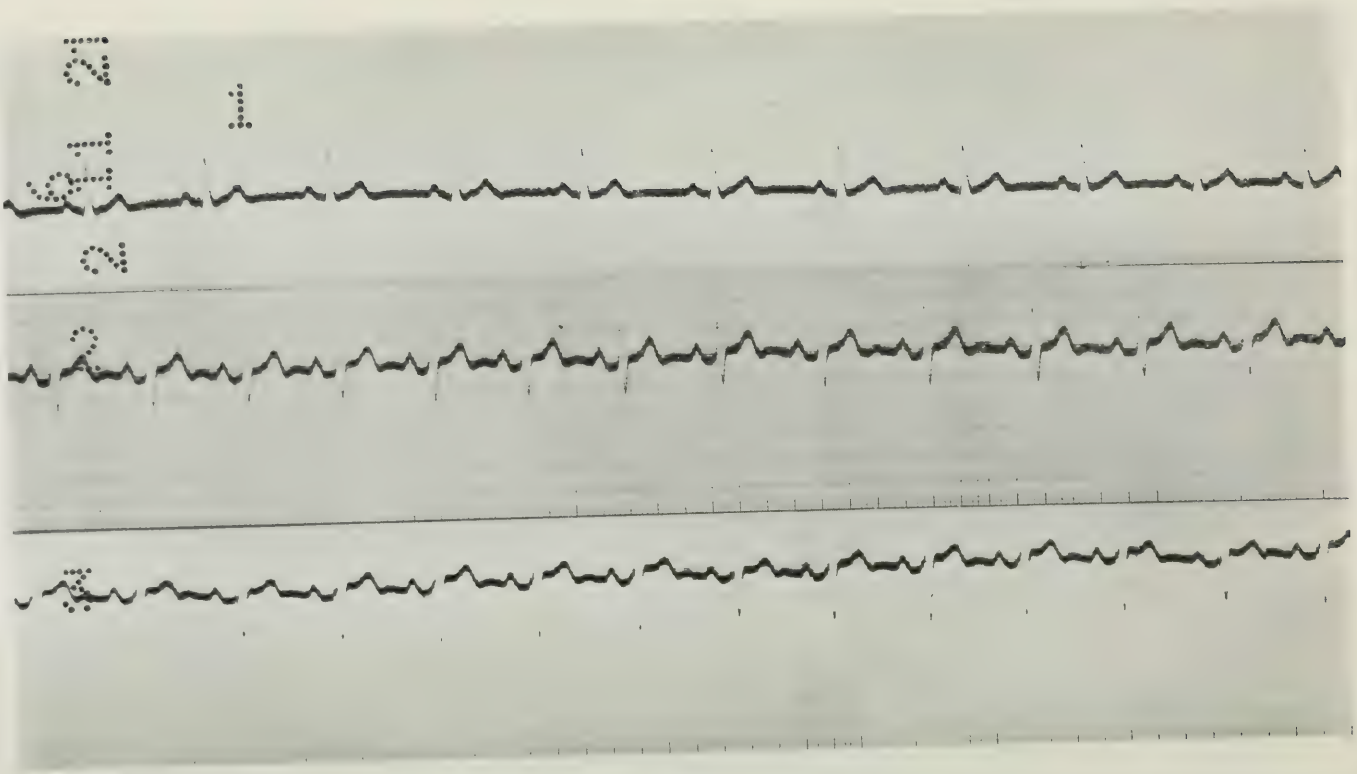
Case VII.—Mrs. O., the mother of three children, had suffered for the past year from palpitation, pain in the left chest, dizziness and weakness. She lived up three flights of stairs and had to climb

Fig. 11.



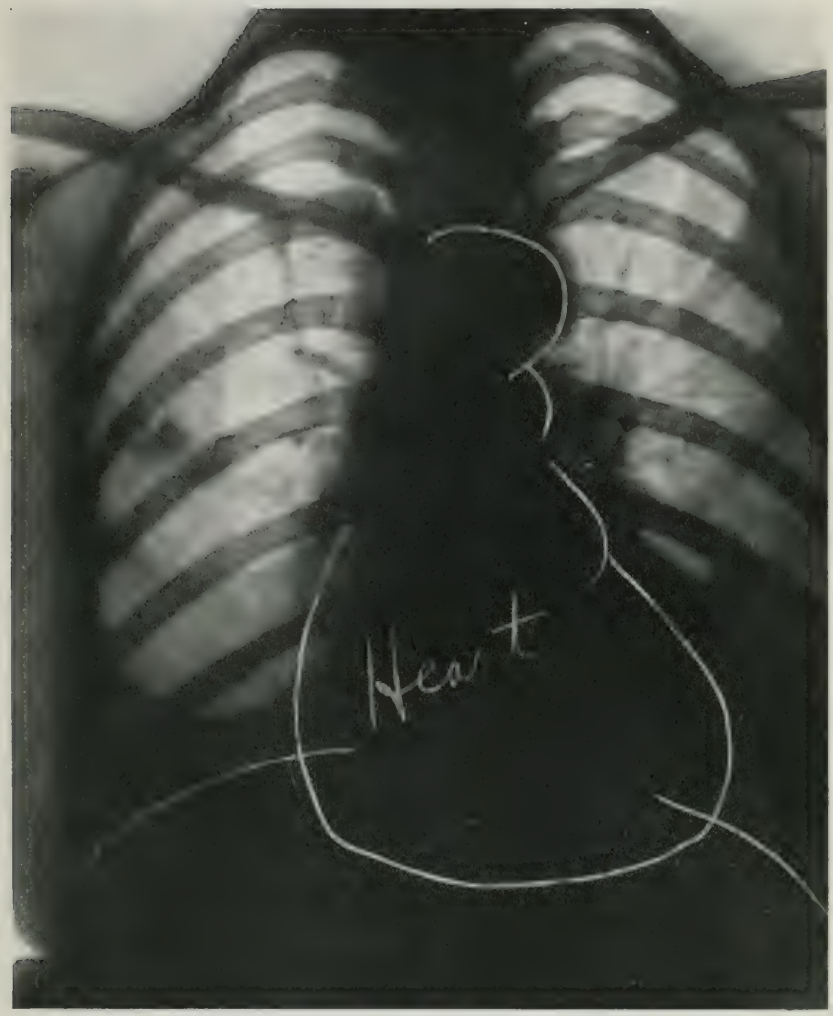
Orthodiagram of Case VI.

Fig. 12



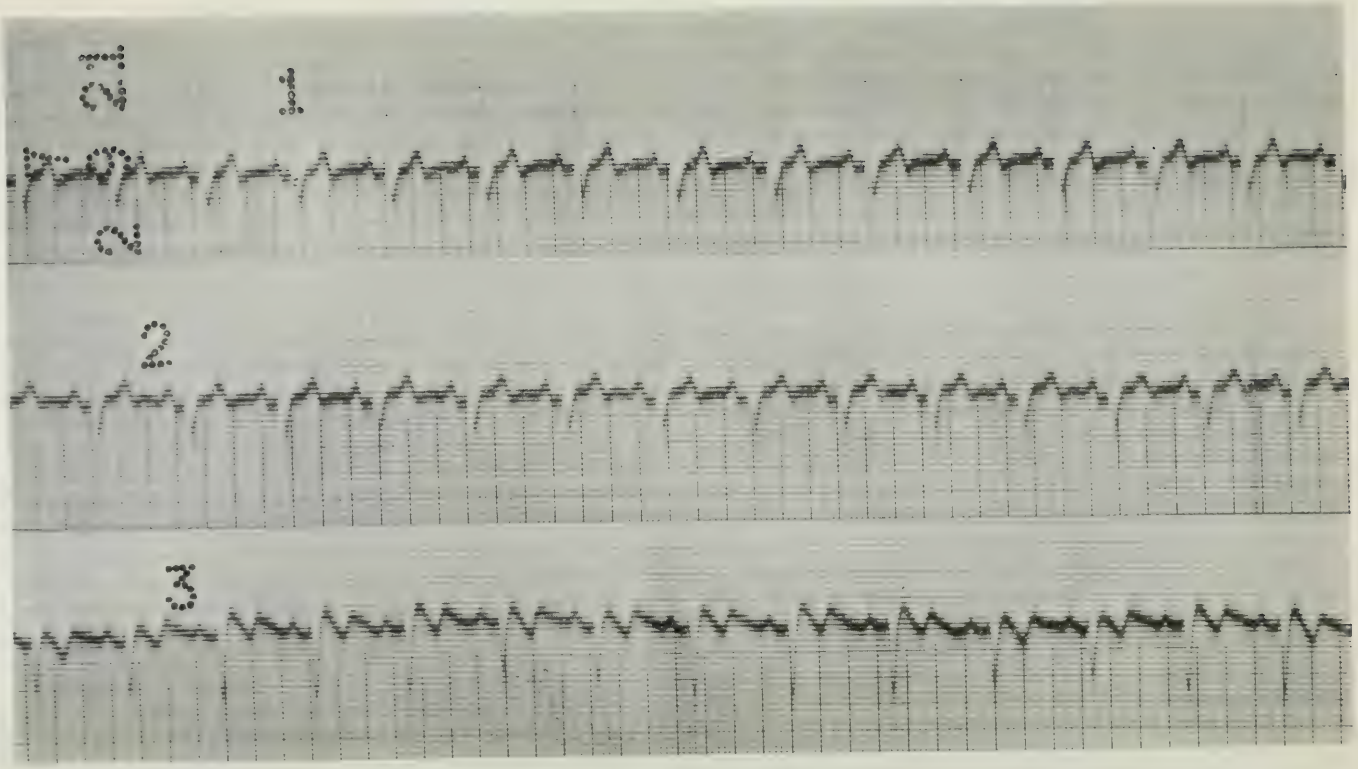
Electrocardiogram of Case VI.

Fig. 13.



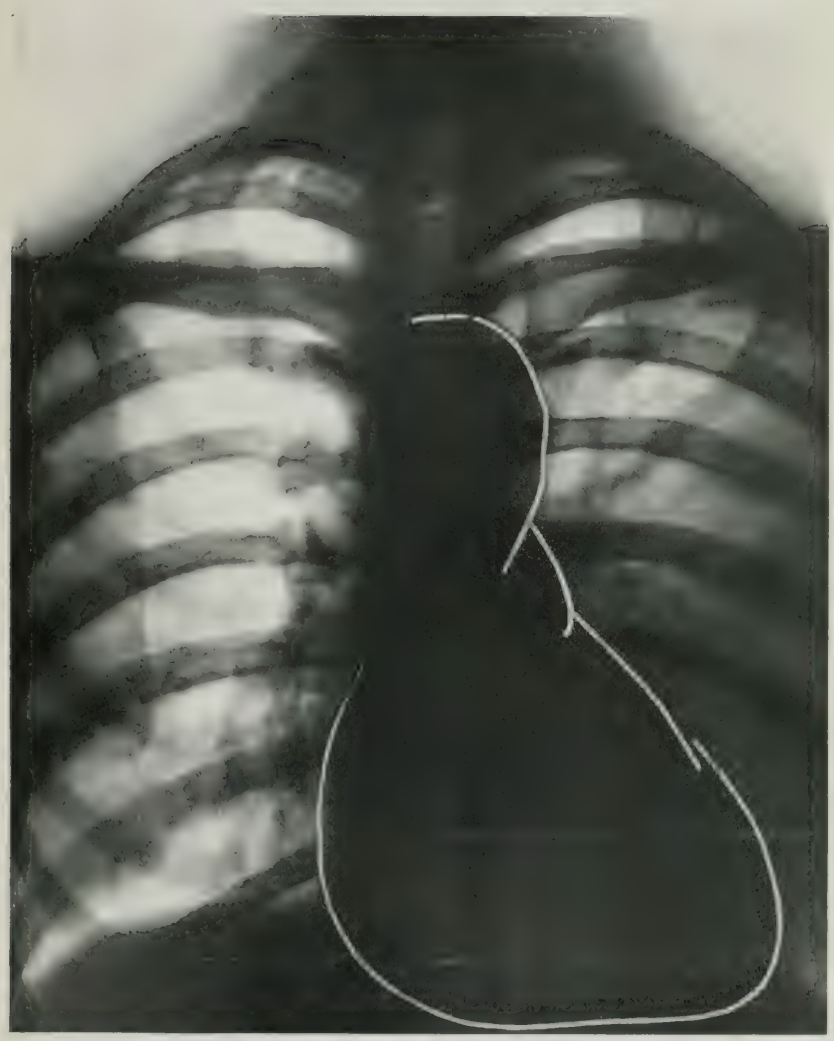
Orthodiagram of Case VII.

Fig. 14.



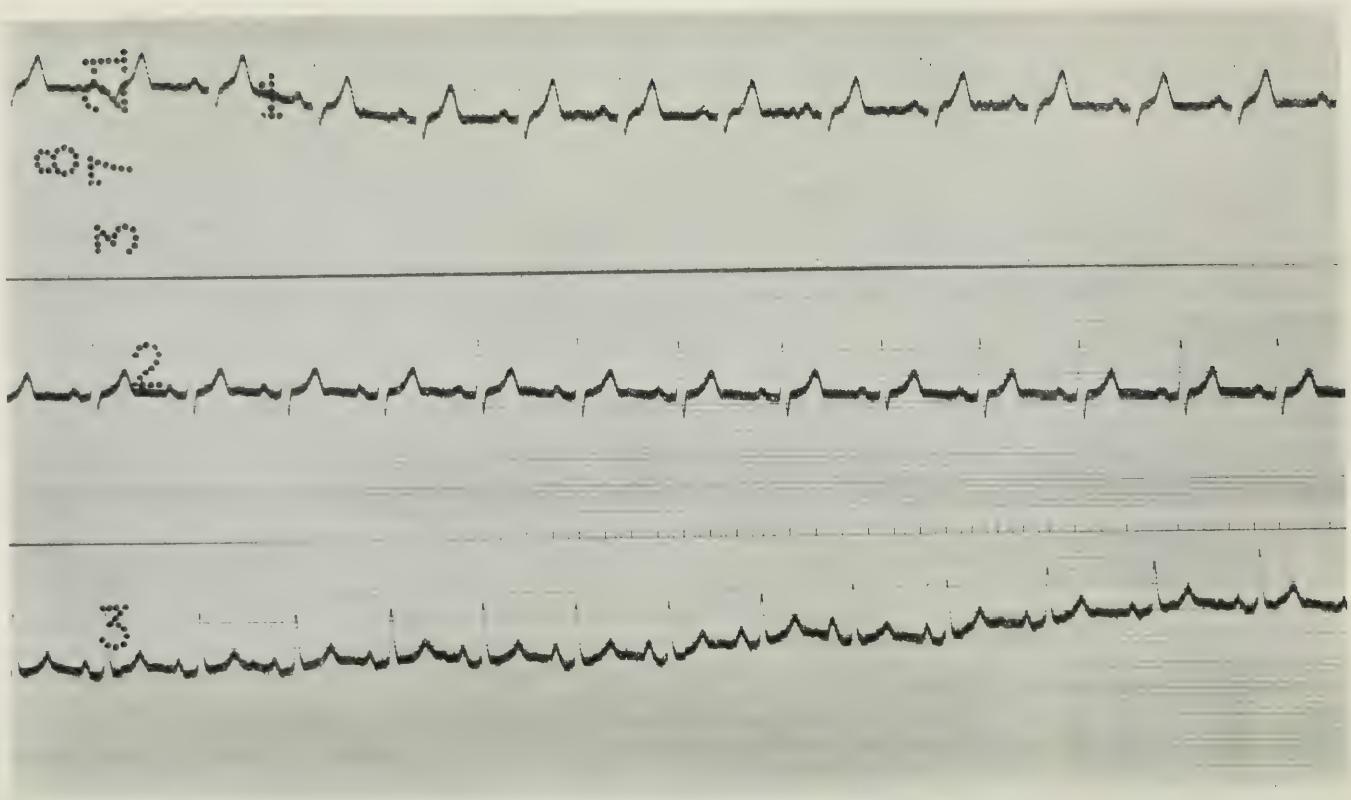
Electrocardiogram of Case VII.

Fig. 15.



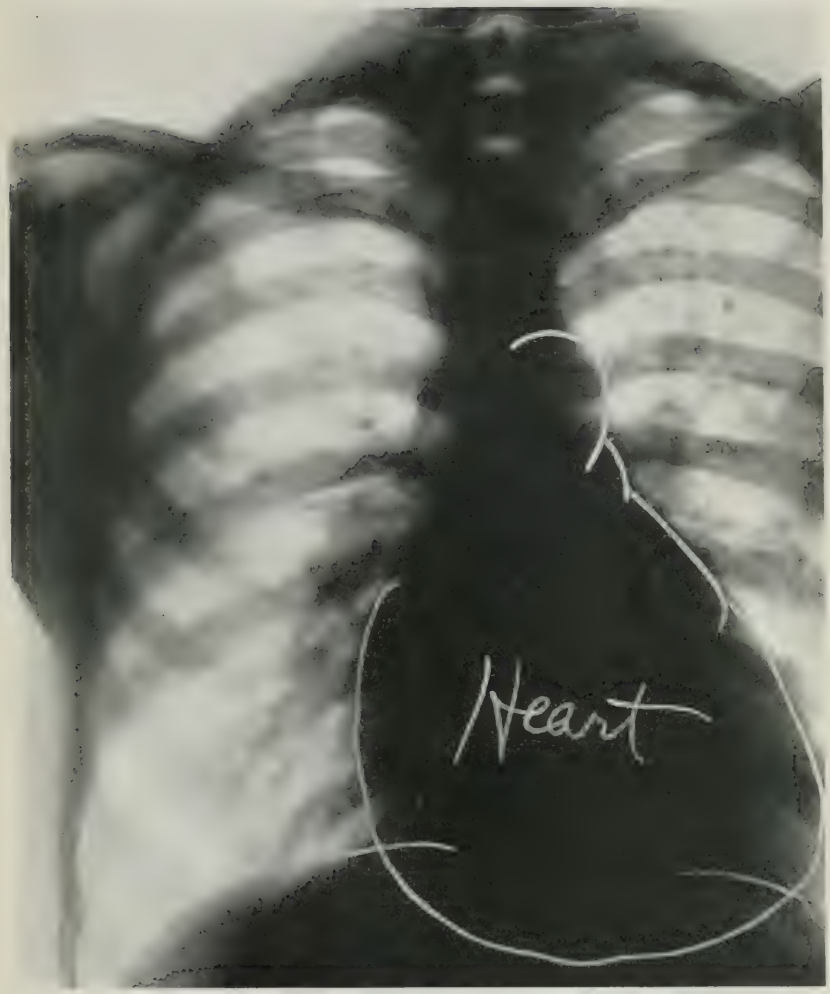
Orthodiagram of Case VIII.

Fig. 16.



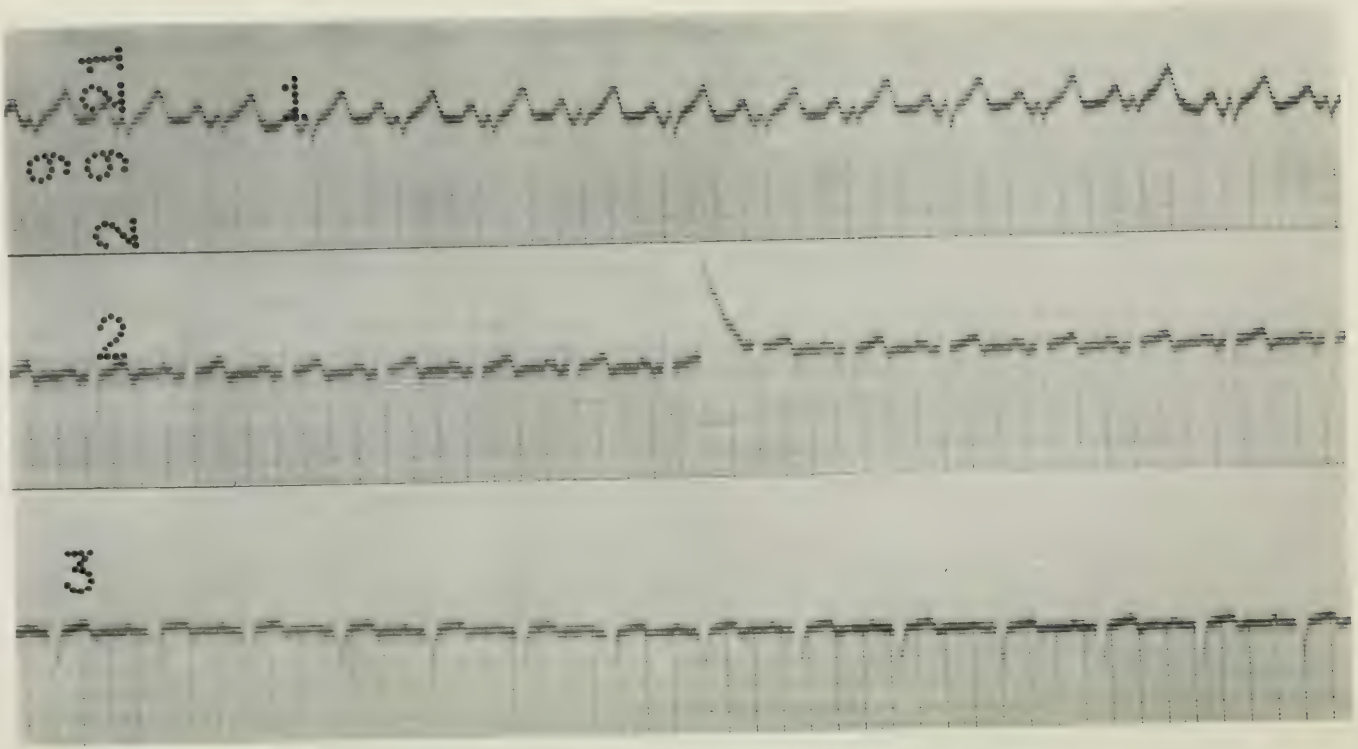
Electrocardiogram of Case VIII.

Fig. 17



Orthodiagram of Case IX.

Fig. 18.



Electrocardiogram of Case IX. The break in lead 2 is an art affect.

them twice a day, always being completely exhausted on reaching the top. She slept fairly well, except when awakened by palpitation. At times she had attacks lasting an entire day. A few blocks walk on the level tired her and produced marked dyspnœa. She had an almost constant frontal headache with occasional severe occipital pain. The pulse was 88 and somewhat irregular. The blood-pressure was 195/115. The urinalysis showed nothing significant. The blood-count gave 6,400,000 red cells with 85 per cent. hemoglobin. The Wassermann reaction was negative. The electrocardiogram showed no irregularity except slight sinus arrhythmia. The orthodiagram showed a practically normal heart.

This case was an example of arteriosclerosis.

Case VIII.—Mr. P., aged 26, a jewel cutter by trade, was of slender build, a nervous temperament and somewhat of a stammerer. For the past year he had had shortness of breath, sometimes on exertion and at other times when quiet. He was easily startled and became nervous for slight cause, at which times he would notice rapid beating of the heart. He had pain in the left shoulder and in the knees. After meals there would be a sense of fulness, with eructation of gas.

On physical examination an inflamed pharynx and poor teeth were found. The lungs were negative. The heart was enlarged to the left and gave a soft systolic murmur at the apex and base. The pulse was slightly irregular with a rate of 88, full and soft. The blood-pressure was 135/85. The epigastrium was sensitive. The urine was negative except for considerable amount of calcium oxalate. The blood-count gave 6,480,000 erythrocytes with 95 per cent. hemoglobin. The Wassermann reaction was negative. The electrocardiogram indicated predominence of right side and slight sinus arrhythmia. The orthodiagram showed a practically normal heart.

This case is an example of a poorly developed and unstable heart in an individual of the same type.

Case IX.—Master M., aged 16, a schoolboy, gave a history of rheumatism at the age of eight, and numerous subsequent attacks of tonsillitis. He has complained for two years of distressing shortness of breath and palpitation even on slight exertion.

The throat had a moderately inflamed pharynx with infected

crypts, the tonsils having been removed. The lungs were negative. The heart was enlarged to the left and gave a loud double murmur over the apex, and a low diastolic murmur over the sternum. The hands were cold and cyanotic. The urine was of high specific gravity, 1.003, and gave a weakly positive reaction for sugar. The hemoglobin was 85 per cent. and the red cells 5,870,000. The Wassermann reaction was negative. The electrocardiogram revealed a relative right predominence. The orthodiagram showed general hypertrophy.

This case is an example of chronic endocarditis associated with tonsillar infection.

Case X.—Mr. L. D., aged 38, a street railroad investigator, had had repeated attacks of rheumatism, tonsillitis and peri-tonsillar abscess. A little more than a year ago he suddenly realized that he was very short of breath on climbing stairs. He was treated for a time and improved, but for the past six months has been worse, so that slight exertion produced dyspnœa and discomfort in the left chest. He had a sense of fulness in the epigastrium, swelling of the ankles and some cough.

On physical examination the heart was found to be enlarged to the right and left, the apex being at the axillary line. There was a loud systolic and a low diastolic murmur. The fluoroscope showed a large rounded heart with poor systolic excursions. The pulse was 126 and irregular. The blood-pressure was 140/100. The abdomen was distended and the liver 8 cm. below the costal border. The urine contained traces of albumin and a few hyalin casts. The blood-count gave 7,464,000 red cells with 85 per cent. hemoglobin. The Wassermann reaction was negative.

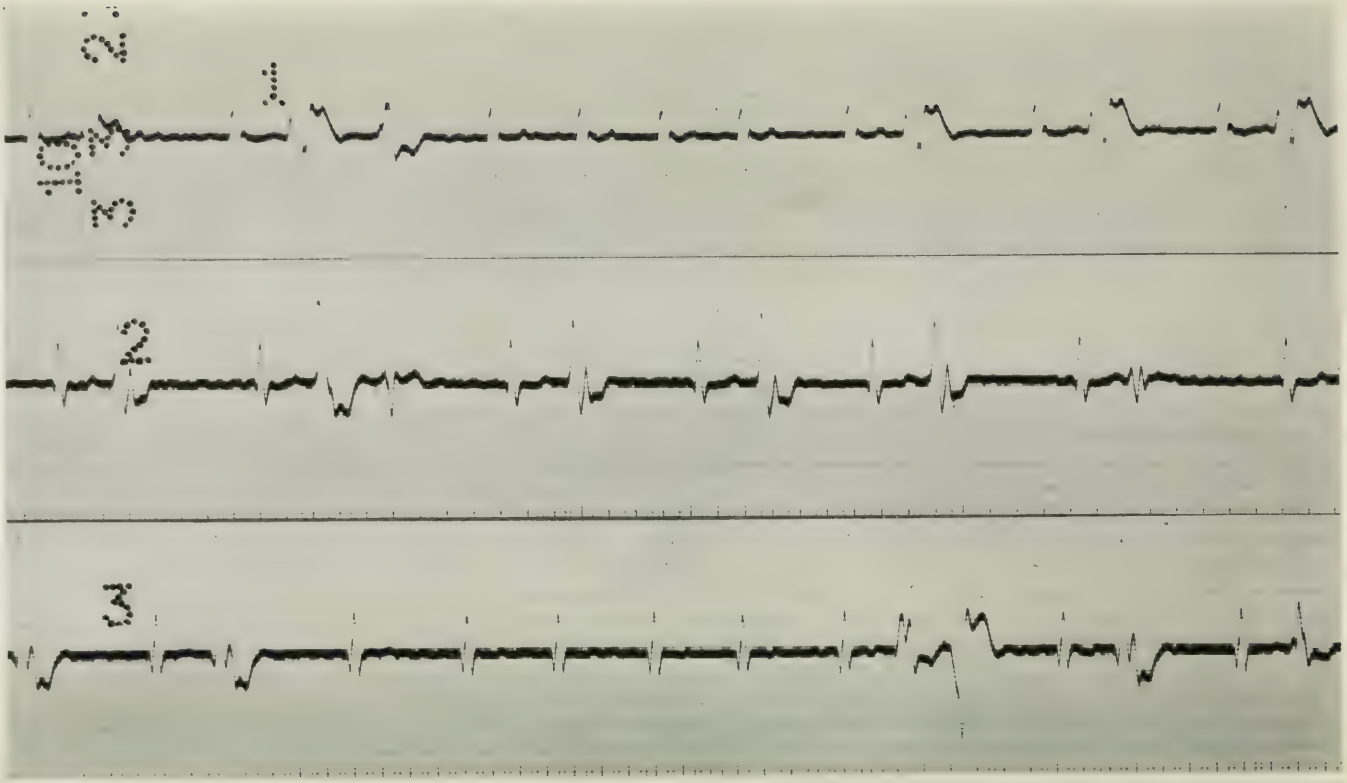
This patient was the last person of the series of ten first to apply at the clinic. He represents a type of condition that, when properly managed in the light of modern cardiology, gives more brilliant results than any other problem in cardiology. The clean-cut knowledge of this man's condition that is given by the orthodiagram and the electrodiogram is surprising, and truly enough we did get a brilliant result, and he has been the chief agent to spread the fame of the clinic among those who have sought our care. His response to treatment was not merely due to the use of digitalis in regulated doses, but also to the regulation of his diet and his general hygiene.

When this patient came to the clinic he was short of breath,

Fig. 19.

Orthodiagram of Case X.

Fig. 20.



Electrocardiogram of Case X.

œdematous, his liver was swollen, and he was much discouraged through the failure of many physicians to relieve him. The diagnosis had always been myocarditis according to his statement.

Without giving up his occupation he was put through the routine plan of investigation, involving a strict diet, serial doses of castor oil and digitalis to saturation. The electrocardiogram shown herewith is not the one that was taken when he first came under observation, but was taken when the heart was partly under control. It shows many extra systoles.

This man was interesting to us because he had had so much experience with the casual treatment in many institutions, and he expressed astonishment that cardiology could be precise and definite in its observations and treatment.

In studying these ten examples it is necessary to remember that they are the first ten people who came to the clinic, studied in the order of their appearance, and some conclusions can be drawn, even from ten, as to the kind of work that a clinic of this kind will be called upon to do.

The first observation is that they all suffer from persistent discomfort referred to the region of the heart. Everyone knows that most valvular heart trouble is usually without any such discomfort. In private practice it has been my observation that knowledge of the latter has come to the people through life insurance examinations or the observation of their medical attendant. This raises the question whether persistent discomfort referred to the region of the heart justifies a diagnosis of heart trouble. In most of these people a careful study made it evident that there was at least an unhygienic condition of the heart muscle due to wrong diet. This was in several instances relieved when the general metabolism of the person was looked after.

So, the first function of the clinic seems to be to afford relief of cardiac pain or of such symptoms as palpitating bad breathing or dropsy that are obviously due to the heart.

The second function of the clinic, as shown particularly by the younger sufferers, is the appraisal of heart conditions in such a manner as to make a safe criterion to determine the amount of immediate and future activity that can be enjoyed.

The third function is to afford a technical basis for the treatment of the severer types of heart failure as illustrated in Case X.

109 East 61st Street, New York City.

CLINICAL LECTURE BY DR. GEORGE W. NORRIS

Prof. of Clinical Medicine, University of Pennsylvania. October 19, 1921, Pennsylvania Hospital, Philadelphia

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ACUTE HEMORRHAGIC ENCEPHALITIS

DR. NORRIS: The case you saw in the clinic last week, I can briefly report on, as showing some symptomatic improvement. You may remember the colored woman whom I exhibited here, and in whose case the diagnosis was in question, as to whether it was tuberculous adenitis or Hodgkin's disease. We have still been unable to make a positive diagnosis. A little later on this morning, I hope to be able to show you sections from a gland, which has been excised, under the microscope, side by side with sections showing typical Hodgkin's disease. The gland in question is not typical; so that, despite this method of examination, we are still rather at sea regarding the etiology of the case.

The first case that I am presenting to you to-day is one that is very unusual. It has not been our habit here to present strange cases, or curios in medicine, as much as it has been our effort to show you more or less typical cases, with what one might call more or less average variations; but this man's case is so unusual that I bring him before you for a brief demonstration.

He was admitted to the hospital in an unconscious condition, on the 10th of this month. No history could be obtained, other than that he had gone to work in the morning and returned some time later in the day. At night, he was found unconscious and sent to this hospital.

The physical examination at that time showed a man in deep coma, with twitching of the right side of the face, and also apparently some facial weakness on that side. There was partial paralysis of the right arm and leg. There was no ocular paralysis, but there was a slight nystagmus. The patient was carefully examined; and otherwise, everything was negative.

Now, with a history such as that (and I may say parenthetically

that this man is twenty-eight years of age), what would you think as to the possibilities of diagnosis?

ANSWER: Cerebral hemorrhage.

DR. NORRIS: Yes. He is a little young for that; but it is possible.

ANOTHER ANSWER: Uræmia.

DR. NORRIS: A little more likely, I think, at his time of life.

The man was admitted with evidences of complete right-sided hemiplegia, and you think he might have had a cerebral hemorrhage. What else causes complete hemiplegia?

ANSWER: Embolism.

DR. NORRIS: That is much more likely, I think, in a young man; but the fact that this man's heart is absolutely normal, so far as we can determine, would apparently throw out the likelihood of acute endocarditis and embolism. There are two other things. What else do you think of that causes hemiplegia in the young? Do not forget what Charcot told his students: "If any of you know tuberculosis and syphilis in all their forms, you know half of medicine." This may have been syphilitic. I think that the three most likely things are syphilis, embolism and cerebral hemorrhage.

Now at one o'clock on the night following his admission the patient had a generalized convulsion, which began in the right arm and extended over the whole body, lasting five minutes. It was later followed by five other similiar generalized convulsions, so severe that we had to employ not only bromides and chloral, but also chloroform. Later on, it was found that a Babinski was present on the right side, and also ankle clonus. Leucocytes in blood=18,400.

Lumbar puncture was done, with the idea that if this were cerebral hemorrhage, we should probably find bloody fluid. Imagine our surprise on finding fluid under great pressure, having a cell count of 1250 per cubic millimetre—an enormous increase in cells; and nearly all these cells were polynuclears. Now that, of course, made us think of cerebrospinal meningitis. Cloudy fluid with a high cell count and increased pressure; and yet, with the character of the lesion—unilateral paralysis—it was almost inconceivable that hemiplegia should be produced by what is usually a generalized meningitis, involving the spinal and cerebral meninges.

We had the patient examined by Doctor Packard with regard to his nose and ears, nothing being found. We were thinking, of

course, of brain abscess. Doctor Shoemaker reported that his eyes were divergent, with muscular instability; a clear disc; well-defined blood-vessels; no hemorrhages, exudates or other lesions. The eye-ground examination was entirely negative.

The next day we had our consultant neurologist, Doctor Strecker, see him; he making the following notes: "Neurologically there is right-sided paralysis without spasticity, and with moderately increased reflexes, the classical Babinski and the Oppenheim are present; no clonus; moderate cervical rigidity, with a suggestion of Kernig's sign, and probably a Brudzinski. I have not seen a case like this; but, in view of the findings I could not diagnose it otherwise than cerebrospinal meningitis. If it were not for the fluid, I should not consider this diagnosis seriously, and can only explain the peculiarities on a basal situation of the exudate."

Careful search of the spinal fluid failed to reveal any meningococci. Nevertheless, the man received daily lumbar punctures and injections of antimeningococcic serum.

Two days later—and this shows how important the history of the case may be—this history was obtained: The patient was in Mt. Sinai Hospital three weeks ago, with a double lobar pneumonia. He was discharged in fair condition and had been at work a week, having resumed work while still feeling, as he terms it, "fainty." On the day he was stricken, he was allowed to go home because he complained of feeling badly.

See how completely this changes our ideas regarding the etiology. We know that meningitis is not a particularly rare complication of pneumonia. We know that it nearly always occurs during the acute stage of the disease, and usually during the later part of it. Sometimes it appears with the very onset of the pneumonia, in those cases in which the pneumococcus infection has become a general septicemia from the start. It so happens that a number of years ago I had occasion to look up the literature of pneumonia rather extensively; and I chanced to remember a case that was reported in which meningitis had followed the pneumonia by a considerable period. I looked it up last evening, and found that Aufrecht had recorded a case of meningitis due to the pneumococcus which followed two months after the lobar pneumonia. We cannot quite equal that report. Our

patient developed meningitis three weeks after his discharge from the hospital.

Now are we sure that this is a pneumococcus meningitis? We have not been able to demonstrate any pneumococci in the spinal fluid. We have injected two mice, with negative results—no peritonitis, and no organisms whatever. If it is not meningitis, what else could it be?

I think we must go back to the suggestion made at the beginning of this lecture. May not this be an embolic manifestation, the result of an acute endocarditis, a sequel of his pneumonia? He now has somewhere in his brain, probably in the cortical region on the left side, an embolus, which has broken down and suppurated, so that now there is an abscess in that region, which communicates with his cerebrospinal fluid. We know that endocarditis, especially an endocarditis involving the aortic valve, is not very rare in pneumonia. An embolus from the aortic valve might readily be carried up to the brain and lodge there, producing paralysis; and later go on to abscess formation.

There is not much more to add. The patient's condition is practically unchanged except that he is more toxic and a little weaker. He takes some notice of what goes on. (To patient) Lift up your hand. (To students) See how he moves his right hand with his left. Have you a pin? (Someone gave the doctor a pin, and he pricked the patient with it.) One of two things is certain: Either he has anæsthesia there, or else his general sensation is so dull that he does not feel what we are doing. Otherwise, he would probably try to draw that hand away with the other one. (Doctor Norris then pulled the patient's hand up and let it go, and it fell, limply.) Notice the absolute flaccid paralysis. The same condition obtains in the leg.

This man has received a number of injections of antimeningococcic serum without benefit. Lately we have simply been withdrawing spinal fluid and replacing it with normal salt solution. We have not been able to obtain any pneumococci which we could "type." If we had been able to, we might have given him antipneumococcic serum intraspinally.

Notice here the character of the temperature chart, with a rather steady tendency to decline from 100°, until it has now reached the point of 99° F. The pulse and respirations, especially the pulse,

are increased; pulse, 152, with respirations 24. (The patient was removed.)

The prognosis here, of course, is very bad; and the treatment, I think, must be purely symptomatic. Search of the literature indicates that some cases of pneumococcus meningitis have recovered; but we must always suspect, in these cases, that perhaps we are dealing with some other form of meningitis, and not a real pneumococcus infection. (The foregoing patient died shortly afterward, and the autopsy disclosed: Acute hemorrhagic encephalitis. The left precentral convolution was the seat of well-marked hemorrhagic areas with beginning softening. Slight meningitis was also found.)

CARDIAC DECOMPENSATION

(A second patient was brought in.)

Dr. Norris: Mr. Burket, will you give briefly the essentials of the history of this patient?

Mr. Burket: The patient is a Chinaman, who came into the hospital about the first of July, with auricular fibrillation. He was in such a bad condition that strophanthin had to be given him intravenously. He remained in the hospital for three weeks, and then went out again. Now he comes back with the same condition. He has shortness of breath, weakness and gastrointestinal disturbances. He has pain after meals, which is not relieved by vomiting. He has ascites and slight œdema of the legs.

Dr. Norris: What we want is his history, not the physical examination.

Mr. Burket: I could not get a history of a chancre from him, and could not get a very definite idea of how the trouble started. The only thing that I could find out was that on the first of July he came to the hospital with the same condition as now.

Dr. Norris: Of course, we have been handicapped by the language question. It is very difficult to communicate with the patient. But the history is essentially as given by Mr. Burket—Failure of compensation, developing last July; several weeks in the hospital; discharge; attendance at the heart clinic, where, again, they had difficulty in making him understand. It is a question how well he cooperated with Dr. Stroud in following the instructions given. A further break in compensation took place, and he returned to the

hospital a few days ago. Tell us of the physical findings on admission.

Mr. Burket: He has a cardiac impulse.

Dr. Norris: Before we get to that, is there anything that it is important to note on general inspection?

Mr. Burket: The man is not very well developed. He is emaciated and shows a tumor on the back of the neck which is probably a cyst. His chest shows emaciation. He has a deepened supraclavicular fossa.

Dr. Norris: There are much more striking and important things than that. The emaciation is, I think, important. Here is a man who comes with a history of cardiac decompensation. What are the important things to look for?

Mr. Burket: Pulsation.

Dr. Norris: Yes. The vessels are distended; the external jugulars stand out like whip cords; and there is marked pulsation above the clavicle, which is apparently arterial.

Mr. Burket: There is œdema of the legs, which was more marked at the time of admission than it is now.

Dr. Norris: That has diminished, and apparently disappeared. What else is it important to note in a cardiac patient?

Mr. Burket: Cyanosis.

Dr. Norris: Do you think this man is cyanotic? No, you would hardly say that he was. What else?

Mr. Burket: Dyspnœa.

Dr. Norris: He is a dyspnœic? Well, I think that point could be debated. Upon lying down flat, he displays some polypnœa; but it is not dyspnœa. Dyspnœa means subjective discomfort on breathing; polypnœa means rapidity of breathing. The latter he has, but not the former. It is important to note these things, because our prognosis and diagnosis of heart disease depend to a considerable extent on the patient's symptoms. We no longer believe that we can determine the seriousness of a heart lesion by the character of a murmur or by the pulse tracing, or even by the electrocardiogram alone. All these things help, however. One of the important things is to find out what the man can do. Does he have to sit up in order to get his breath? Does he habitually sleep with two pillows? Can he climb stairs only with discomfort? Does he always get short of breath or have cardiac oppression after meals? These things are very important.

Continue the physical examination. I think we have covered inspection very well, except perhaps, the abdomen. Would you say that there was fluid in the abdomen?

MR. BURKET: Yes. The man is emaciated.

DR. NORRIS: I think that is a good point. We suspect the presence of fluid, first, because the abdomen is larger than the rest of the body, which is emaciated; with a little fulness in the flanks.

MR. BURKET: The liver was palpable below the costal margin. The spleen was not palpable. The chest showed increased tactile fremitus over the right upper lobe. The expansion was not so good over the right upper lobe. The cardiac impulse was rather marked. It lay in the fifth and sixth interspaces.

DR. NORRIS: Yes, it is very distinctly visible, heaving in character, displaced downward and outward. That you can determine by inspection alone. What more do you learn by palpation?

MR. BURKET: The heart moves in a wave-like motion. I could not detect a thrill.

DR. NORRIS: That is an important point. Did it seem to lift the whole chest when it came up or was it a slapping, or a throbbing impulse?

MR. BURKET: A slapping impulse, I should say.

DR. NORRIS: Yes. Is there any particular significance attached to a slapping impulse, as compared with a slower, and more heaving one?

MR. BURKET: I should say that the heart was enlarged in its length, rather than in its breadth.

DR. NORRIS: Think about it a little bit. If you place your hand on the precordium and find that it is doing this (slapping), as contrasted with that (pushing), what is probably the underlying difference in the heart muscle?

MR. BURKET: Hypertrophy.

DR. NORRIS: Yes. A strongly hypertrophied heart will lift the whole chest. It seems to remain in contact with the chest wall a long time; whereas dilatation yields a slapping impulse, and seems to lack muscular force. What about the percussion outline?

MR. BURKET: The heart is enlarged—3 1/2 cm.—to the right, and 9 cm. to the left of the mid-sternal line.

DR. NORRIS: Are we quite sure about the right border?

MR. BURKET: Yes.

DR. NORRIS: Why are you so sure?

MR. BURKET: Because I found it there.

DR. NORRIS: You found the percussion outline; but can you always trust that?

MR. BURKET: The right border extends well beyond the sternum; the left is much farther from the midline than it should be.

DR. NORRIS: Yet in a very much enlarged heart, when we percuss in a vertical direction, we finally come to a point where percussion can no longer be vertical, becomes horizontal. When we percuss, we try to get the antero-posterior diameter, not the lateral one. There is a tendency in these large hearts to over-emphasize the extent to which the heart extends to the left. Of course, we check that up. How?

MR. BURKET: With the fluoroscope.

DR. NORRIS: That is one method. Does one merely have to put a man in front of a fluoroscope and look through his chest?

MR. BURKET: I believe that you can determine an enlargement in that way.

DR. NORRIS: Not with any degree of accuracy. In the X-ray, as in all other forms of radiant energy, we have divergent rays which yield an enlarged shadow. Such rays can be eliminated either by the orthodiagraph or by placing the patient six feet from the X-ray tube. (This was illustrated on a blackboard.) The ordinary fluoroscope is worth practically nothing, so far as outlining the heart is concerned. If, however, you have a very small or a very large heart, you can determine it roughly by the fluoroscope. What other methods have you that are more available to the general practitioner than the fluoroscope? You cannot run around with a fluoroscope in your pocket. You want to know how to check up the left border.

MR. BURKET: The apex beat.

DR. NORRIS: How does that help you in outlining the left border of the heart? We know that the left border is farther out than the point at which one can feel the impulse, usually half an inch, and sometimes an inch; so that if the percussion dulness shows 19 cm., and the cardiac impulse 18 cm., you are pretty sure that you are right. Of course, that does not always hold good; in a case of pericardial effusion, for instance, it might be of no value whatever.

Certainly this man has a very large heart, and it is chiefly enlarged to the left. It has a rather characteristic shape. This left oblique diameter is very large in proportion to the right oblique diameter. That suggests an aortic lesion. It may be an insufficiency, or it may be simply a high blood-pressure. What about the murmurs?

Mr. Burket: He has a systolic murmur in the aortic area. It sounds like a roughening of the aorta. He also has a diastolic murmur.

Dr. Norris: Are these murmurs transmitted?

Mr. Burket: The diastolic murmur is transmitted to the left.

Dr. Norris: Is the systolic transmitted?

Mr. Burket: I did not follow the systolic murmur.

Dr. Norris: The systolic murmur is not transmitted to the vessels of the neck. The murmurs are so loud that they can be heard over practically the entire precordium. Are there any other murmurs?

Mr. Burket: Over the apex the heart murmurs are very weak, but there is a definite systolic murmur.

Dr. Norris: I can hardly agree with that. You think he has quite a loud first sound; and, as already pointed out, these murmurs are so loud that it is possible to hear the systolic and diastolic murmurs over the entire precordium. But they are loudest over the aortic area and the ensiform cartilage. What lesion would you think he had from these physical signs?

Mr. Burket: I should suspect that he had aortitis and aortic valvular disease.

Dr. Norris: Has he any of the pulsating phenomena of aortic insufficiency?

Mr. Burket: No, he has not.

Dr. Norris: What do we generally understand by that term?

Mr. Burket: I understand a Corrigan pulse.

Dr. Norris: That is one thing. What else?

Mr. Burket: An arterial pulse.

Dr. Norris: He has that surely.

Mr. Burket: I mean capillary pulse.

Dr. Norris: That he has not. He has marked pulsation in the carotids, has he not?

Mr. Burket: Yes.

Dr. Norris: What is his blood-pressure?

Mr. Burket: It was very difficult to determine, because there are strong beats coming, and some weak ones.

Dr. Norris: What was the systolic blood-pressure?

Mr. Burket: 125.

Dr. Norris: And the diastolic, you think, is about 65? What do you choose as the diastolic criterion? The fourth or the fifth phase?

Mr. Burket: The fifth.

Dr. Norris: Why? Were you taught to do that?

Mr. Burket: We were.

Dr. Norris: It is thought by some that that is the way to determine the diastolic pressure; but I think that both clinical and experimental evidence indicate that it is not the most accurate criterion, and that we have stumbling blocks in every aortic case that comes along. The fifth phase often persists down to zero, and we know that a man cannot live with such an absence of pressure. If you choose the point at which the sound becomes suddenly muffled, in other words, the fourth phase, you can always get it in aortic disease, and you will be more likely to be accurate in the reading you get. Dr. Dewar, what do you get?

Dr. Dewar (Interne): The same using the fourth phase—125/65 mm.

Dr. Norris: You see, Dr. Dewar uses the other method; choosing the fourth phase, and gets practically the same reading. That is not surprising, because the difference in many cases is very small—not more than three to eight millimetres. What about the man's lungs?

Mr. Burket: I believe that he has a lesion in the right upper lobe.

Dr. Norris: You think that it is probably a tuberculosis? Has he an hydrothorax?

Mr. Burket: I could not detect any.

Dr. Norris: Any congestion?

Mr. Burket: He must have, but I could not find it by the physical examination.

Dr. Norris: No; and no râles? Did you demonstrate ascites by percussion?

Mr. Burket: I did.

Dr. Norris: Did it strike you as peculiar that he had ascites with no hydrothorax and without congestion or œdema of the lungs?

I think that is one of the things worth considering. Here is a man with ascites, whom one naturally thinks of as a cardiac patient. He has no congestion of the lungs, no hydrothorax, slight œdema of the lower extremities, and no orthopnœa. The absence of these things makes one think that the ascites might be due to some other cause; and in view of the fact that he has a suspected lesion of his lungs, we naturally think of tuberculous peritonitis; the enlarged liver on the other hand makes us think of the possibility of its being cirrhotic. What other data have we regarding this man? Do we know what the cardiac condition is the result of?

Mr. Burket: I believe, syphilis. He has a four plus Wassermann.

Dr. Norris: The Wassermann, the type of valve lesion and the physical examination indicate that it is probably syphilitic. That being the case, we make a complete diagnosis of what? So far as our study enables us to do so?

Mr. Burket: I make a diagnosis of syphilitic aortitis.

Dr. Norris: Syphilitic aortitis and—?

Mr. Burket: And cardiac decompensation.

Dr. Norris: Anything else? We should try to put down in black and white, on this history chart, everything that a post-mortem could demonstrate.

Mr. Burket: Tuberculosis.

Dr. Norris: Tuberculosis of the right upper lobe. Are we quite sure of this, or do we question it?

Mr. Burket: We are not sure.

Dr. Norris: What else?

Mr. Burket: He had a chronic gastritis; or, at least, some stomach condition.

Dr. Norris: It seems to me that in as much as his gastric condition has cleared up, it is most likely that the condition was a congestion due to dilatation of his right heart, producing congestion of the portal, mesenteric and renal vessels. The latter would account for his transient albuminuria. What about his arteries?

Mr. Burket: They are rather hard.

Dr. Norris: It would seem probable, then, that he had generalized arteriosclerosis. These, I think, are the essential features of the diagnosis. How are we going to treat this man? Assume that you see him as he first came in.

MR. BURKET: Give a digitalis preparation or some other form of heart stimulant hypodermically.

DR. NORRIS: What form would you suggest?

MR. BURKET: In his condition, I think strophanthus would be proper.

DR. NORRIS: You mean that you would give tincture of strophanthus hypodermically?

MR. BURKET: I would give strophanthin, 1/50 of a grain.

DR. NORRIS: That would be a very large dose! Are there any precautions necessary before administering it intravenously? Before you give 1/50 of a grain of that drug to anyone, it is incumbent on you to satisfy yourself of certain facts. Does anyone know what they are? Well, it is simply this: You must be sure that the patient has not already been digitalized. Strophanthin given intravenously acts quickly and powerfully. If the patient had already been taking digitalis for weeks, you might give him a fatal dose of strophanthin. That is an important practical point that you should not forget. But, assuming that you have given this, and that the next day he shows improvement, how would he manifest it? Probably by a slowing of the pulse rate, a diminution in the pulse deficit. What else would indicate improvement?

MR. BURKET: Less orthopnœa.

DR. NORRIS: His general symptoms such as œdema and orthopnœa would have diminished. Now his condition to-day is much better. He is quite comfortable. How are we to gauge the dose of digitalis?

MR. BURKET: By the pulse rate.

DR. NORRIS: In a case of auricular fibrillation, what do you try to bring about by means of digitalis?

MR. BURKET: We try to overcome pulse deficit; slow the heart, so as to produce a better circulation.

DR. NORRIS: What does digitalis really do in these cases?

MR. BURKET: It stimulates the vagus nerves of the heart and lengthens the diastolic period; it slows the pulse, through prolongation of the diastolic period.

DR. NORRIS: Are you all agreed with that explanation: That the effect of digitalis is mainly due to vagus nerve stimulation?

MR. BURKET: There is a question about it?

DR. NORRIS: Yes. What digitalis actually does in auricular fibril-

lation is to produce heart block, so that only some of the incessant auricular stimuli get through to the ventricle. It acts both through the vagus and upon the heart muscle and its conductive system. As a result, we get what kind of pulse?

Mr. Burket: Heart block.

Dr. Norris: That manifests itself clinically, when you feel the pulse, as what? (Drawing on blackboard.) That is what the arterial pulse resembles during auricular fibrillation. Now you give digitalis, and what happens?

Mr. Burket: The radial pulse is probably slowed, and the irregular beats disappear.

Dr. Norris: Yes; the characteristic digitalis effect is a bigeminus. Two beats and a pause, two beats and a pause, etc. This event is important to look for, because that is the time when the digitalis should be diminished or stopped. If you push digitalis beyond that point, you are apt to do the patient more harm than good. When compensation has been re-established we should of course give this patient anti-syphilitic treatment. (This patient was again shown in clinic on November 16th. Compensation had been completely restored and a normal cardiac rhythm re-established through the administration of quinidin.)

Now I am going to ask Doctor Farley to say a few words about the case of Hodgkin's disease shown last week. He is a better microscopist than I, and has done a good deal of original work on Hodgkin's disease; and he has some sections there under the microscope, regarding which he has something to say.

Dr. Farley:[1] There are three sections from the case shown last week, and two showing the typical pathology of Hodgkin's disease. Before you look at them, I will review the histology of the normal lymph-node with the histo-pathology of Hodgkin's disease.

(Drawing on blackboard.)

The normal lymph-node has a compact fibrous capsule. Strands of fibrous tissue pass from it into the node substance. These are called trabeculæ. Lymph sinuses follow the capsule and trabeculæ. The node substance is largely cellular with little stroma. The cells are of two main types—the adult lymphocytes, arranged in cords and being the cell most abundantly present, and the germinal centre cells.

[1] Dr. David L. Farley.

The germinal centres are easily seen in section as rounded structures filled with cells slightly larger than the adult lymphocyte and with a more vesicular nucleus. In addition there are blood-vessels and lymph spaces lined with endothelial cells.

When a lymph-node is excised from a case of Hodgkin's disease, microscopically the first thing noted is a thickening of the capsule; secondly, that the normal architecture of the gland is destroyed. The trabeculæ and lymph sinuses and usually the germinal centres are obliterated, in whole or in part, so that the capsule is filled with a granuloma-like tissue. Sometimes a small portion of the germinal centre remains, but, as a rule, it is obliterated. This is unusual in tuberculosis and infectious adenitis. Usually in these cases some of the germinal centres remain intact. When the constituent parts of the granuloma-like tissue of the lymph-node in Hodgkin's disease are analyzed there is noted a fibrosis, the degree of which varies with the stage of the process. It is not very uncommon in the later stages to have the capsule almost entirely filled with fibrous tissue.

An analysis of the cellular constituents of the gland shows a large number of so-called endothelioid cells. They are large cells with a vesicular nucleus, which stains poorly. They are larger than lymphocytes, and with a somewhat cuboidal elongated nucleus, and with relatively more cytoplasm than a lymphocyte. Lymphocytes both large and small are more or less abundantly present, their number varying directly with the degree of fibrosis. They cannot be distinguished from normal lymphocytes by their morphology. Eosinophiles may or may not be present. In some cases they are very abundant. This is true of the slide under the second microscope. A few plasma cells are usually seen also.

The fourth constituent cells are usually giant cells of a special type. The giant cell of tuberculosis, the so-called Langhans type is very rarely seen in Hodgkin's disease. In Hodgkin's disease, the giant cells have one or more nuclei, usually in the centre of the cell. The nuclei are large and vesicular, the cytoplasm outline is more definite than in the giant cell of tuberculosis and the nuclei are not as numerous as in the Langhans type. Sometimes there is necrosis and sometimes not. This is a variable feature.

To sum up the picture, it is that of a granulomatous disease and not that of a new growth.

The whole subject of the pathology of Hodgkin's disease is somewhat obscure. There are a certain number of cases that cannot be classified exactly. These are placed in a group and called atypical Hodgkin's disease. Dorothy Reed, in 1902, from a series of cases, fixed the pathology of Hodgkin's disease. Not all the cases can be made to fit into the picture described by Reed, so that it leaves a small group which we call atypical Hodgkin's disease. The slides from the patient shown here are from a case in this group. The case is atypical in that it shows very few of the giant cells and endothelioid cells and very few eosinophiles. It is a little difficult to distinguish this form of Hodgkin's disease from so-called Sternberg's disease, which is a non-caseous tuberculosis of lymph-nodes. In this case, we cannot be very certain. Unfortunately, the material was not injected into a guinea pig. If it had been, and the tubercle bacillus isolated, however, that would not have settled the diagnosis; because of the fact that tuberculosis as a secondary infection in Hodgkin's disease is so frequent.

Dr. Norris: I have just learned that this case was first treated in St. Mary's Hospital, where they excised a cervical lymph-node a year ago; and made a diagnosis of tuberculosis, which brings out well the difficulty of distinguishing between the two conditions, which has been referred to by Doctor Farley.

Dr. Farley: If you will pass along, you will see the two pictures that I have described: The simple Hodgkin's and the atypical form.

(This patient died several weeks later. Microscopic studies of the lymph-nodes showed atypical Hodgkin's disease and guinea pig inoculations failed to reveal tubercle bacilli.)

TWO CASES OF ANÆMIA SIMULATING PERNICIOUS ANÆMIA

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1. Case of Gastric Cancer.—Consideration of symptoms of anæmia and the character of this patient's anæmia; of achylia gastrica and intestinal indigestion. The importance of the stool examination. The symptoms of gastric cancer.

2. Case of Simple Anæmia Due to Dental Sepsis.—The distinction from pernicious anæmia. The value of gastric analysis. Notes on the pathologic physiology of anæmia.

I am going to show you to-day two patients with anæmia who previous to a complete medical study were believed to have pernicious anæmia. Both these cases illustrate the value of simple laboratory tests. Blood examination, however, was not the most important laboratory test that was made.

Case I.—The first case is that of a married man aged 60, who gives the following summarized history. His occupation is that of a clerk in a grocery store.

Present Illness.—About one-and-a-half years ago he first experienced shortness of breath with palpitation of the heart upon exertion. Both of these symptoms together with a mild sense of weakness persisted and increased until about one year ago, when his symptoms began to decrease gradually, so that six months ago they had disappeared. During the following five months he had no symptoms of any sort, but during the past month he has suffered again very definitely from shortness of breath on exertion. There has been, however, only slight weakness. With his dyspnœa, he has a dull pain located in the centre of his chest. He states that he can do everything that he wishes to and feels perfectly well except when he exerts himself sufficiently to produce his presenting symptom.

A year ago, at the time the dyspnœa was quite marked, his friends

told him he was pale, though he did not realize that his color had changed. With the subsidence of the dyspnœa his color improved, with its recurrence in the past month, the pallor has returned.

For over 20 years he has had "indigestion." This has consisted of occasionally suffering from the belching of gas occurring especially after eating excessively and of rich food. There also have been many times when for days at a time he passed large amounts of gas by rectum. Rarely has there been an ill-defined distress in the epigastrium. At no time has there been nausea, vomiting, jaundice, or attacks of sharp pain. His bowels move regularly, without cathartics, and his stools for years have tended to be rather soft and mushy. He has not noted that they have been of any abnormal color. He emphatically states that his indigestion has been definitely less in the past three years than in the preceding ten. He considers this due to the fact that he has avoided excess of food and especially meats and fats. He has taken pains to explain that he had practically no gastrointestinal symptoms during the past year except during one week, six months ago. At this time, following the eating of many oysters and much meat, he was bothered for a week with relatively mild abdominal distress. The patient has been cross-questioned carefully about his gastrointestinal symptoms and it is evident that he has none other than those referred to, and that they have been definitely less, not more evident in the past year and a half.

He has lost ten pounds in the past two years, but his weight in the past three months has remained the same.

During the past three years he has been bothered for days at a time with itching of different parts of his body, particularly of the legs.

For six years he has had to pass urine three to four times at night, but there has been no frequency during the day. There has never been any dysuria. He denies venereal disease.

There has been no soreness of the tongue or abnormal sensations in the hands or feet. In fact no other symptoms have occurred in the past two years referable to any of the organs of the body.

Past History.—Except for influenza three years ago, diphtheria and tonsillitis when young, he has had no illnesses nor symptoms, though he recognizes that he always has been of a somewhat nervous temperament.

The *family history* and social history are essentially negative, and his habits have been good.

The *physical examination* shows a well-developed, intelligent, somewhat nervous man, standing 5 ft. 10 in. and weighing 155 lbs. He is definitely pale. His color is intermediate between a pure white pallor and a definite sallowness. The teeth are in poor condition and pyorrhœa is present. The röntgen rays have revealed marginal pockets and erosions about the bases, with two apical abscesses at the roots of two upper molars.

The heart is not enlarged. The sounds are regular, and the first sound slightly weakened in character. There is a short, soft systolic murmur localized at the apex. The systolic blood-pressure is 120; the diastolic, 70.

The abdomen has been examined critically several times and has presented no abnormality except that the edge of the liver, smooth and non-tender, can be felt on the deepest inspiration.

On the right lower leg anteriorly are two circular scars the size of a fifty-cent piece. The skin over these areas is atrophic and parchment like.

Rectal examination shows that the prostate gland is hard, smooth, and somewhat enlarged. The frequency of urination at night can be accounted for by simple prostatic hypertrophy. There is no reason to consider his urinary symptoms referable to any other condition.

Complete physical examination of all the other organs and parts of the body reveals no abnormality, including no enlargement of the lymph-nodes.

The hemoglobin determined from the oxygen capacity of the blood is 40 per cent., and it is evident from the patient's appearance that he is anæmic. However, you must realize that pallor does not always mean anæmia. Individuals may look pale who do not have a reduction of their hemoglobin available for carrying an oxygen supply sufficient for the needs of the body and in whom the amount of hemoglobin per unit of blood is not less than normal or in whom the red count is not reduced. Pallor dependent upon vaso-constriction or increase of fluid in the tissues, as probably occurs in chronic nephritis, or increase of subcutaneous tissue as in myxœdema, often may suggest considerable anæmia that is not found upon examination of the blood.

One can quite readily account for the patient's dyspnœa on exertion, palpitation, and slight weakness, as dependent upon a diminished amount of circulating hemoglobin. It is rather surprising that he has not had other symptoms due to anæmia, *per se,* such as vertigo, headache, irritability, disturbances of vision, tinnitus, lack of appetite, œdema of the ankles, and greater weakness. With anæmia impairment of the function of different organs occurs, as, for example, the myocardium becomes weakened. A common result of this is to produce a weakening of the first sound of the heart and a relative dilatation of the mitral valve, detected by a soft systolic murmur at the apex. Thus the abnormalities of this man's heart can be attributed to the anæmia.

We can account for the presenting symptoms by anæmia, but of course the question arises as to what is the type of anæmia, and if of a secondary type, to what is it due? Pernicious anæmia is characterized among other features by periods of good health alternating with periods of poorer health. The fact that this man gradually developed symptoms attributable to anæmia without other symptoms a year and a half ago, that these gradually improved between one year and six months ago, and have returned in the past month, strongly suggests that he has experienced a relapse followed by a remission, and now a further relapse of pernicious anæmia. Cases of pernicious anæmia commonly give a history of indigestion of long duration before anæmia develops, and such a history is given by this patient, so that it furthers the suggestion that he may have this disease. There have been, however, no symptoms of periodic soreness of the tongue so common in pernicious anæmia. Likewise there has developed no paresthesiæ of the hands or feet, or other symptoms to suggest any degeneration of the spinal cord that is of such common occurrence in pernicious anæmia.

Further examination of the blood is important. It shows the following:

Hemoglobin	40 per cent.
Red count	2,900,000 per cu mm.
Color index	.7+

The red cells show marked achromia and a moderate variation in size, averaging slightly smaller than normal. There is little variation in shape. True microcytes or cells to suggest fragmenting red

cells are not observed. There are no macrocytes. Cells slightly larger than normal that are round occur and these are usually polychromatophilic. The reticulated red cells (young red cells stained with brilliant creysl blue) are 4 per cent. No blasts or other histological abnormalities of the red cells are noted.

The fragility of the red cells to hypotonic salt solution shows a somewhat increased resistance.

The blood plasma is the color of water, which indicates that it contains no abnormal amounts of bile pigments.

The blood platelets occur in at least normal numbers.

The white count is 6000 per cu. mm. The differential count of 200 cells is as follows:

	Per cent.
Polynuclear neutrophiles	59
Polynuclear basophiles	1
Polynuclear eosinophiles	1
Large mononuclears	10
Lymphocytes	29
	100

The blood examination quite definitely rules out the disease primary pernicious anæmia. Cases of pernicious anæmia never have the amount of achromia or so low a color index as shown by the patient's blood, while the absence of microcytes and deep-staining macrocytes in the presence of 40 per cent. hemoglobin makes such a diagnosis exceedingly improbable. Cases of pernicious anæmia, at least when the hemoglobin is below 70 per cent., nearly always show an increase of bile pigments in their plasma associated with impaired liver function and increased blood destruction. This patient's clear plasma alone is practically enough to rule out such a diagnosis.

This blood is characteristic of a secondary anæmia due either to chronic blood loss or to some cause particularly producing a simple defective blood formation. It shows none of the features especially associated with blood destruction. There is evidence that the blood is being formed in a fairly satisfactory manner because of the presence of slight increases of young red cells, (Reticulated red cells are young red cells and normally are not over 1 per cent.) a normal number of platelets and bone marrow white cells, which are the three chief elements formed in the bone marrow. The blood does not show the marked increases of platelets, marrow white cells, and reticulated

red cells usually observed following acute hemorrhage, when a normal marrow is called upon to supply the loss.

In anæmia from chronic blood loss, or simple anæmia due to defective blood formation, no radical change takes place in the type of blood formation such as seems to occur in pernicious anæmia. The red marrow itself shows hyperplasia, but the cells resulting from this effort at increased activity would seem to enter the circulation slowly, though those that do enter may be young or even very immature. A part of the defect in formation may be because the cells produced are defective not only in their structure, which perhaps permits them to die prematurely, but perhaps because hemoglobin either from lack of material or from unknown cause cannot be properly synthesized. Thus the detailed blood picture in such cases will vary with the degree and duration of the anæmia and the degree of response that the marrow is able to make, particularly by increasing its rate of growth. Likewise variations in the picture will depend directly upon the cause of the anæmia itself because the causative factor may have a special influence on one or another of the blood elements. For example, sepsis causes leucocytosis, and typhoid leucopenia. Thus it is difficult to interpret exactly the state of the blood-forming organs from its elements in the peripheral blood. One can, however, learn a considerable amount regarding the activity of blood formation, its progress and retrogression from time to time by scrutinizing microscopically the blood in any given case. It is perhaps possible to obtain some information regarding the condition of the marrow from the fragility of the red cells to hypotonic salt solution. For example, experimental data at hand suggest that an increased resistance (as shown by this patient) in anæmia at least from blood loss indicates chronicity and considerable marrow hypertrophy.

A further consideration of the diagnosis led one to consider the possibility of syphilis owing to the scars on the tibiæ. However a negative Wassermann reaction has been obtained.

So far we have learned that though pernicious anæmia seemed a plausible diagnosis from the history, the blood examination demonstrates the anæmia to be of the secondary type and syphilis to play no part. In any case for study it is desirable to examine routinely the blood, urine and stools. The routine urine examination has shown no abnormality. It has not been examined for its phenol

or indican content, substances when found in definite excess point toward abnormal intestinal digestion.

Gross inspection of stools often yields significant information regarding the digestion. This patient's stools are dark brown in color, semi-formed and mushy when freshly examined. Their reaction is strongly acid and their odor abnormally offensive. Many bubbles of gas occur intermittently mixed with the stools so that they crackle when stirred with a stick. The normal stool should not be foul or strongly acid, nor will it form gas bubbles, at least to any significant degree, even on standing eight hours. Stools of the character passed by this patient when obtained without catharsis are indicative of an intestinal indigestion or fermentation. This condition in turn may be dependent upon abnormality of gastric secretion or disease elsewhere than in the intestine. The ill-defined history of indigestion for years together with the character of the stools suggests that this patient has had for a long time an intestinal fermentation; a condition which can be greatly benefited by a diet of just sufficient calories to maintain body-weight together with avoiding the more easily fermentable carbohydrate foods and excess of protein. Though cases with chronic intestinal indigestion are apt to have a slight anæmia, such a diagnosis alone in this case cannot account for the degree of anæmia.

The routine examination of the stool should include not only its careful inspection but a microscopical examination and a test for occult blood. The microscopical examination of several specimens has revealed nothing that can be considered abnormal. The gross character of the stools does not suggest the presence of occult blood as they do not appear sticky or tarry, as is classical of stools containing a considerable amount of occult blood. In spite of their appearance, the guaiac test for blood has been strongly positive on five specimens, including one collected fifty-six hours after the patient had had no meat. This laboratory test has given us much more information than the blood examination and indicates a definite cause for the anæmia. The cause of the bleeding is yet to learned.

A fractional analysis of the stomach contents shows the absence of free hydrochloric acid in each of the eight specimens collected at fifteen-minute intervals half an hour following the ingestion of a test meal. The greatest total acidity of any specimen was 5 c.c.

decinormal sodic hydrate, indicating a very low total acidity. The gastric contents showed no evidence of stasis, blood, lactic acid, or abnormal microscopical elements. Thus this patient has true achylia gastrica. If we had simply tested the gastric contents at one time following a test meal, we could not have determined whether there was a delayed secretion of the gastric juice which at a later time might have shown an increased acidity or not. The fact that all the specimens showed no free hydrochloric acid and a very low total acidity demonstrates a true achylia rather than a spurious form. Achylia gastrica permits poor gastric digestion so that the stomach contents enter the intestines in a state that is difficult for proper completion of digestion within the intestines. Thus achylia may lead to diarrhœa as well as an intestinal indigestion which causes the passage of stools of the gross character passed by this patient. The patient's achylia may be of a primary type and have been present for years. If so, it could account for the long-standing indigestion. It is common for patients with achylia to be of the nervous temperament exhibited by this man. The itching he has had may be looked upon as a toxic manifestation of the intestinal indigestion. It is a symptom that rather often occurs with this condition.

Achylia is practically always present and persistent in cases of pernicious anæmia, which disease we have ruled out. It is a very rare finding with chronic indurated peptic ulcer, while of common occurrence with gastric cancer. The majority of cases of achylia are not associated with malignancy, and many cases develop the condition without association with another disease unless it be a neurosis. It may occur in the last stages of a chronic gastritis. It may be observed in chronic infectious arthritis, and temporarily during or following infections of various types. With chronic gall-bladder disease it is common. Among other conditions it is found with intestinal paresites, diseases of the thyroid, pregnancy, and chronic passive congestion.

This patient's achylia *per se* does not of course account for the bleeding demonstrated by the stool examination. There is almost no other condition that causes bleeding from the gastrointestinal tract that is associated with achylia except cancer. A röntgen ray examination has revealed that this is the diagnosis and that which was suggested by the study of the stools and gastric contents.

Doctor Holmes' röntgen ray report is as follows: "The barium mixture passed readily through the œsophagus into the stomach. There was a definite irregularity in filling in the mid-portion and a stiff area rather high up on the lesser curvature over which peristaltic waves did not pass. Peristalsis was deep, rather sluggish, and at times reversed. There was no abnormal residue at the end of six hours. A normal sphincter and first portion of the duodenum was seen. The cæcum was movable and not tender. The appendix was not visible. The barium mixture passed through the colon in the normal time. There is a lesion high up on the lesser curvature of the stomach that in all probability is malignant."

In view of the absence of increasing gastric symptoms, Doctor Holmes' finding is rather surprising, yet it seems to establish rather definitely a diagnosis of cancer of the stomach. The case illustrates very well the fact that gastric carcinoma may develop insidiously, resembling the onset of pernicious anæmia and with the absence of symptoms pointing directly to the stomach. This general type of history is obtained in about five per cent. of the instances of malignant disease of the stomach, and in such cases the diagnosis is arrived at only by a critical study. Rarely cases of gastric cancer give blood findings simulating pernicious anæmia. A few cases of gastric cancer give symptoms that suggest angina pectoris or cardiac disease rather than gastric, and such cases are often incorrectly diagnosed. A common feature of onset is a dragging, burning or gnawing pain usually referred to the epigastrium and sometimes to the shoulder or back. Usually a history is obtained of increasing dyspeptic symptoms, anorexia, nausea, vomiting, often hematemesis, progressive, often marked loss of weight and strength, and anæmia with its attending symptoms. The anæmia is often produced from the effect of the growth itself depressing blood formation, while at times probably some pathological blood destruction develops. In other instances the anæmia is particularly dependent upon blood loss. The apparent remission that this patient had between one year and six months ago clearly suggests that bleeding had occurred early, ceased, to recur again in the past month. Thus we may consider that his anæmia is more dependent upon blood loss than upon the effect of the tumor itself. The patient has had none of the common symptoms of the disease except anæmia and slight loss of weight. The absence

of other symptoms is probably dependent upon the location of the lesion which has not seriously interfered with gastric function. Its location makes it impossible to palpate the mass which, owing to its size, could readily be done if it involved the lower portion of the stomach. It is important to recognize that the development of what might be termed insignificant gastric symptoms, anorexia, belching, etc., in individuals over 45 years of age, is to be looked upon as definitely significant and should always suggest organic disease. On the contrary, such symptoms in a patient of younger years much more often are found dependent upon a functional than an organic condition.

It is interesting to speculate, but no conclusions can be drawn, on the relation of the long-standing mild dyspeptic symptoms that this patient has had to the development of cancer. Many cases having chronic indigestion do not develop cancer, while perhaps ten per cent. of the cases of cancer of the stomach give a history of chronic indigestion. In some such cases ulcer of the stomach has been present. It seems not unreasonable to assume that as he has for a long time passed semi-formed stools and had dyspeptic symptoms, this patient has suffered for years from an intestinal indigestion. One can only conjecture as to whether the achylia has been present for years or not, and has been the cause of the improper digestion, or whether its development is due to cancer.

In carcinoma the degree of total acidity is usually much higher than in this case. It is usually much higher in cancer than in idiopathic achylia gastrica, while lactic acid and Oppler Boas bacilli are often found with the former but not the latter. Thus partially on account of the character of the stomach secretion but more because of the history, it seems not improbable that an achylia has been present for at least some years. Simple idiopathic achylia rarely causes nausea or vomiting, while it commonly causes more or less gastric discomfort and intestinal disturbances such as this patient has had.

(This patient was anxious to be operated upon. This was done by Dr. Daniel F. Jones, following a transfusion of blood, and at operation a large indurated mass was found on the posterior curvature of the stomach, and which proved to

be cancer by pathological examination. No metastases were observed in the liver or elsewhere. The liver which was just palpable on physical examination appeared to be simply in a slightly lower position than normal. Three-quarters of the stomach were removed. The patient has improved markedly in the past two months, and his hemoglobin is now 75 per cent.)

This case illustrates the value of studying each case you see, taking a systematic history, and making a complete physical examination, and routine laboratory examinations of blood, urine and stool, supplemented by other tests according to circumstances.

Case II.—The second patient, presented symptoms of anæmia two years ago, and I shall describe his condition at that time. At present he appears entirely healthy.

He is a man of 44 years, an electric-car conductor. His summarized history taken two years ago is as follows:

Present Illness.—During the six months before he entered the hospital he had grown progressively weak, experiencing abnormal fatigue, increased sensitivity to cold, slight dyspnœa on exertion, ill-defined dull headaches, a poor appetite, occasionally nausea and some slight gastric distress, belching of gas, and rather persistently a disagreeable taste. He had lost seven pounds in five months and then weighed 130. He felt sick enough to give up his work a week before he came to the hospital. There were no other symptoms. In spite of the abnormality of his teeth, referred to below, he stated he had no pain or real discomfort from them, though he realized they had been in bad condition for several years. The bad taste that he has noted can readily be attributed to the condition of his teeth.

Past History.—He considers that he has always been a very healthy individual, and he has had no previous illnesses except measles as a child and an occasional "cold in the head."

The *family history and social history* are negative, and his *habits* are good.

The *physical examination* two years ago showed a distinctly pale individual who seemed weak and tired. There was no sallowness and the scleræ were clear. There was marked pyorrhœa. The teeth appeared in very poor condition; some were broken and loose, and many were carious. Pus could be expressed from sinuses at the roots of two upper teeth. The röntgen rays revealed one exceedingly

large and seven large apical abscesses while smaller ones were observed associated with three other teeth. Complete physical examination revealed no other apparently significant abnormalities. There was, however, a soft systolic murmur localized in the pulmonary area. This murmur was undoubtedly functional. The lower half of the right kidney was palpable but not tender.

The *blood examination* showed:

Hemoglobin	60 per cent.
Red count	3,150,000 per cu. mm.

Both of these determinations were repeated several times, yielding essentially the same figures.

The color index was 1.

The red cells showed a very definite, yet not extreme, variation in size. There was no definite achromia nor were the cells deeply stained. A general macrocytosis was not present, but not infrequently there occurred cells that were larger than normal. These were usually round, occasionally very slightly oval in shape, and often polychromatophilic. A few showed fine stippling. In approximately every third oil immersion field of the microscope a true microcyte occurred that often showed tailing or an abnormal shape. Abnormality in shape of the larger cells was slight. The reticulated red cells were 3 per cent. No blasts or other abnormal features of the red cells were observed.

The fragility of the red cells to isotonic salt solution was not abnormal.

The blood serum was yellow and contained a slight excess of bile pigments.

The platelets occurred in numbers considered to be near the lower normal limits.

The white count was 9000 per cu. mm. The differential count of 200 cells was as follows:

Polynuclear neutrophiles	74 per cent.
Large mononuclears	5 per cent.
Lymphocytes	21 per cent.
	100 per cent.

No eosinophiles or basophiles were seen. The Wassermann reaction on the blood was negative. The urine and stools were negative.

The symptoms he had at this time can all be attributed to the diminished amount of circulating hemoglobin in his body, while the insidious onset and progression of his symptoms suggested strongly the diagnosis of pernicious anæmia. He has not had either the recurrent tongue symptoms nor any central nervous system symptoms so commonly observed in this disease. Likewise his tongue does not and did not appear atrophied, as is usual in pernicious anæmia. Dental sepsis is frequent in patients with primary anæmia so that there was nothing observed upon physical examination to be inconsistent with such a diagnosis. The patient's color was not the typical grapefruit tint observed in this disease, but with pernicious anæmia many simply appear pale. The blood was consistent with the diagnosis of pernicious anæmia, but was not typical of the condition. At least twenty per cent. of cases of pernicious anæmia coming for diagnosis come when their blood is not typical of the condition.

This blood was not typical of pernicious anæmia because of the absence of a general macrocytosis and large deep-staining, abnormally-shaped, usually oval macrocytes, while the variation in shape and degree of microcytosis, was distinctly less than is commonly seen in this disease. The color index is often higher, the platelets fewer, the white count lower, and blasts though characteristically present are frequently not observed. The larger red cells in this blood were usually round, seldom a trifle oval. It is distinctly unusual in pernicious anæmia for the larger cells to be predominately of this character. The slight increase of bile pigments in the plasma was consistent with pernicious anæmia. Commonly there is a considerable increase. It would have been of value to know the amount of bile pigments excreted in the bile as determined by observations on the duodenal contents because, as referred to when discussing the first case, these pigments are found increased considerably above normal in pernicious anæmia due to alteration of liver function and increased blood destruction. This test, however, was not made.

There is a test that was made upon this patient that is an exceedingly valuable one when one cannot establish definitely a diagnosis of pernicious anæmia from the history, physical examination, and the blood. It is the determination of the acidity of the gastric contents. Cases of pernicious anæmia practically always show an achylia gastrica that persists in spite of marked remissions or relapses and

develops early in the disease, not infrequently long before anæmia is apparent. A diagnosis of pernicious anæmia with the presence of a normal amount of free hydrochloric acid is nearly always incorrect. This patient showed an entirely normal amount of free hydrochloric and combined acid in his gastric secretion. There was no abnormality of the amount or character of the contents. Thus, this finding taken together with an atypical blood, the absence of characteristic tongue and nerve symptoms, practically ruled out pernicious anæmia as the correct diagnosis.

It was thought that on account of the ill-defined gastric symptoms, that could be accounted for by the anæmia and perhaps partially by his bad teeth, he might have had, however, some abnormality of the gastrointestinal tract. His history would be compatible with the disease the first patient had, namely gastric cancer; while a duodenal ulcer, giving few symptoms, from which bleeding had occurred, might have produced his symptoms. A röntgen ray examination of the gastrointestinal tract failed to reveal pathology of any sort. This was taken to indicate, together with the other facts learned about the case, that it was improbable that there existed any lesion of the gastrointestinal tract.

It occurred to some that the palpable right kidney might not be a normal organ, in a slightly ptosed position. However, renal function and ordinary urine examinations, as well as cultures of the urine and the röntgen ray studies of the kidneys all yielded negative information.

We have not considered yet as the cause for this anæmia the one definite abnormality, except the pallor, observed on physical examination, namely the dental sepsis. Dental sepsis is a cause for anæmia, but does not produce as a rule the degree of anæmia that was shown by this patient. Dental sepsis is a common condition and one does not want to attribute all symptoms that a patient presents to such a condition until other possibilities are ruled out. In recent years there has been a tendency to condemn too often small apical abscesses as the cause of many conditions. When apical abscesses are present, undoubtedly they should be removed, but one must be careful not to put the blame for a patient's general condition on such an infection unless the evidence is carefully weighed for and against the influence of the diseased area.

In order to diagnose adequately a case of anæmia, one must consider the pathologic physiology of the anæmia. This was alluded to in the discussion of the first case. I wish briefly to refer to certain aspects of the production of anæmia before considering further the anæmia this patient had, and the diagnosis. Anæmias may be classified according to the method of production, though an exact classification of each case is not always possible. In some anæmias, such as some of those due to sepsis, more than one method of production is operative. Anæmia may be produced by mechanical blood loss under a wide variety of conditions. It furthermore may be produced by a simple or serious alteration in blood formation which may be mainly qualitative—a defective or inadequate formation—or the alteration may be quantitative, as in myelophthsis and aplastic anæmia. Also anæmia may be produced by an increased blood destruction in the body, when the blood destruction is not completely compensated by increased blood formation. Such an anæmia is known as an hemolytic anæmia. Acute hemolytic anæmia may be due to marked sepsis, certain poisons, etc. Chronic and acquired hemolytic jaundice produce an anæmia considered particularly due to abnormal blood destruction with relatively little alteration in the character of the blood formation. Rarely chronic sepsis may produce the condition of acquired hemolytic jaundice. Pernicious anæmia is intimately associated with a blood-destroying agency, but there is also a serious alteration in the degree and character of blood formation.

Lack of evidence of blood loss by hemorrhage or by destruction is always a strong point in favor of an anæmia due to defective formation. To be sure, in cases of each type of anæmia, the blood findings ordinarily present certain characteristics. Nevertheless, following blood loss either by hemorrhage or by destruction a condition of defective function of the marrow may finally result. This is particularly true of certain anæmias produced by blood destruction, such as may be seen in sepsis and malaria. In these conditions the increased destruction may vary in degree and when it is distinctly evident the resulting anæmia may be classed as hemolytic. There are probably all gradations between typical cases of hemolytic anæmia and typical cases of anæmia due to defective formation. The same cause acting differently may be responsible for different types and degrees of anæmia. Infection may produce a

fatal complete aplastic degeneration of the marrow, or an arrested growth or function of the marrow; while it, also, can produce a rapidly fatal acute hemolytic anæmia. Infection more usually produces slight anæmia due to defective formation, with which there may be evidence of some, usually relatively slight, blood destruction. It is probable that in some cases of anæmia considered to be due to defective formation, there may be some abnormal destruction of red blood cells which cannot be detected by our present methods, or which takes place quite differently from the blood destruction in the hemolytic anæmias. There is indirect evidence of blood destruction in some of the simple secondary anæmias, which anæmias are due to known causes. For example, the relatively sudden appearance of anæmia in some of the acute infections, notably, acute infectious arthritis, can hardly be explained by a defective marrow function. Nevertheless it appears that the essential factor involved in the continuation of such an anæmia is a defective activity of the bone marrow, particularly as concerns the delivery of normal blood elements into the circulation.

The anæmia the patient presented was consistent with one produced by some blood destruction, but a relatively greater defective blood formation, a common type of simple anæmia due to sepsis. The presence of a few true microcytes, some of which were tailed, suggests that abnormal blood destruction was a factor in the production of his anæmia; as these cells were scant and the abnormal-shaped cells few, the degree of blood destruction was apparently slight. To support this view, other factors associated with increased blood destruction were absent, namely, considerable increase of bile pigments in the plasma, increased red cell fragility, and enlargement of the spleen. There is no evidence of blood loss by hemorrhage, and the blood does not show the degree of achromia seen following chronic hemorrhage. Small red cells may occur from defective formation, they are then rare and seldom show any tailing or other appearances to suggest fragmentation, as did the microcytes in this patient's blood. It may be considered that the character of the blood formation was not seriously altered from normal in view of the relatively normal appearance of the red cells and numbers of white cells and platelets. The presence of polychromatophilic cells and a slight increased number of reticulated red cells indicated that increased numbers of young

red cells were being delivered into the circulation. The slight leucocytosis would indicate the same. This may be dependent upon the focal sepsis itself while the response of the marrow to the anæmia may contribute to the numbers of polynuclears. The fact that the platelets occur in no greater numbers indicates no increased response of their parent cell, the megakaryocyte of the marrow.

It was considered that the patient's anæmia was due to the focal sepsis as no other condition was found that could account for the anæmia, and the character of the anæmia was consistent with such a cause. Usually such cases do not show as high a color index as this patient had and the blood is usually more classical of simple secondary anæmia, because achromia is more marked, larger red cells fewer, while often microcytes are absent. That the diagnosis of a secondary anæmia due to dental sepsis was the correct one is borne out by the fact that at the end of four months following complete removal of all the infected areas and the adjustment of suitable artificial teeth, the patient was symptomatically well. At that time the hemoglobin was 80 per cent., the red count 4,700,000 per cu. mm., while the blood microscopically showed but trivial deviations from normal. The patient has continued to feel perfectly well and the blood to-day shows no abnormality, the hemoglobin is 95 per cent., and the red count 5,200,000 per cu. mm.

This patient illustrates well one of the effects of marked dental sepsis, and how the anæmia it may produce can simulate pernicious anæmia. The later condition, however, was not ruled out definitely by the blood examination but by the gastric analysis.

In conclusion I recall to your attention that though both these cases simulated pernicious anæmia, and that blood examination was important, the most important laboratory examination was that of the stool in the first case, and the gastric secretion in the second. Complete study of such cases leads to the diagnosis.

A comprehensive study of anæmia demands a conception of its pathologic physiology. All symptoms and signs should always be considered from this point of view. The discussion given of achylia gastrica and the symptoms of anæmia are illustrative.

THE IMPORTANCE OF FOREIGN PROTEINS AND OTHER FOREIGN SUBSTANCES IN THE ETIOLOGY OF DISEASE

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Skin tests to foreign protein are being used more and more as one of the modern methods of diagnosis in a great variety of chronic diseases. In certain diseases such as hay fever, asthma, urticaria and eczema, they have definitely proven their value and are being used especially in the cities as almost a routine procedure. Occasionally this use of skin tests is one of utmost value and benefit to the patient, but, on the other hand, tests may be done in a large number of similar cases with rarely a positive result. Furthermore skin tests may be done, but through misunderstanding and misinterpretation of the reactions the ultimate result is of little value to the patient and by suggesting misleading and time-consuming methods of treatment may even do harm.

There are at least two methods of performing skin tests with foreign substances. Perhaps the simplest is the cutaneous or scratch method. The substances to be used for the test must in most cases be extracted since the active principle usually exists in the protein fraction. Extracts for this purpose are made primarily in water or salt solution from which they are precipitated, purified and finally dried by washing in alcohol and ether. They are used in dry powder form for the tests[1]. These powders are all soluble in decinormal sodium hydrate solution. In the case of such chemically simple substances rich in protein, as egg white or beef juice, the fresh material may be used if it is found more convenient. Raw cow's milk will at times give a test in cow's milk-sensitive babies. The cutaneous method consists in applying a series of drops of 1/10 normal sodium

[1] These test powders can now be obtained commercially. In the author's clinic the products of the Arlington Chemical Company are used.

hydrate made up with normal saline, to the patient's forearm and then adding to each drop in turn a few granules of the test substance. A solution of the powder is thus made *in situ* on the arm and with a sharp point such as a knife or a needle, a small scratch is made through the solution and through the outer layer of the skin, but should not be deep enough to draw blood. In performing the tests some care should be taken to place the closely related test substances such as horse, cat and dog hair or wheat, oats and rye, as far apart as possible so as to try to cause any positive reactions to be separated one from the other by one or more negative reactions.

Positive reactions to this test appear within twenty minutes and are characterized by the formation of a raised, sharply defined urticarial wheal of irregular outline surrounded by a zone of erythema. In the reading of these tests the actual measurement of the urticarial wheal as well as the zone is quite unimportant, and positive findings should be based upon the fact that the positive test is definitely and distinctly larger than the other negative and control tests. In case there is any doubt as to whether a certain reaction is positive or not, it is always to be considered as negative. This last is important because at times particularly in the urticaria cases the patient's skin is very irritable and though urticarial wheals are produced of such a size that they would be obviously positive in the arm of another person, yet here they would be called negative because all the other tests produce urticarial wheals of fairly definite size, all due to the irritability of the skin and not at all to any specific reaction.

The second method of testing the skin is the intradermal method which consists of injecting between the layers of the skin a known quantity of the protein in solution of known strength. These protein solutions must of course be sterile and must give absolutely no reaction in the arm of normal individuals. In other words they must not be irritating in themselves and for each test a clean and sterile needle must be used. Obviously this method is more complicated and more difficult than the other, but, on the other hand, is of more definite value in certain cases where, in spite of a fairly definite history of protein sensitiveness, the test by the ordinary scratch method is negative.

In many cases, especially in hay fever, the protein sensitiveness

can be easily demonstrated by placing in the conjunctival sac a drop of the protein solution. Within a few minutes the eye will become red, watery and the lids swollen, which reaction will last for perhaps an hour gradually subsiding itself or can be controlled either with adrenalin or cocaine.

I would like to give you an idea of the importance of susceptibility to foreign proteins in the etiology of disease. I will begin with a brief discussion of hay fever which, as you know, is the simplest form of hypersusceptibility and which also is very common.

Hay Fever.—A patient comes in in August complaining of a severe head cold together with redness, itching and copious watery discharge from eyes and nose of recent origin. The history will show that each August a similar chain of symptoms develops on some particular day, usually in New England about August 20th, and lasts until the frost. This period of symptoms is almost exactly comparable to the period of actual presence in the air of the particles of ragweed pollen and this accounts for the fact that the very first frost rapidly brings about relief from the trouble. If an extract of ragweed pollen is applied to the skin of such patients or dropped into the conjunctival sac, a violent local reaction will appear in twenty minutes, whereas no such reaction will occur under similar circumstances in normal individuals. Treatment with an extract of ragweed pollen will bring about in most cases a well-marked relief from the severity of the disease. That ragweed pollen is the substance actually responsible seems proved by three factors, namely, (1) the fact that the time limits of the disease are entirely the same as the time limits of pollenation. (2) That a specific skin test is produced. (3) By the effects of treatment. As a matter of fact with such a typical history of hay fever recurring each year at this typical time, skin tests are practically unnecessary for diagnosis. They are of use in treatment in order to determine the degree of sensitiveness. This I need not go into here.

However, there are other conditions closely related to late hay fever which are caused by hypersusceptibility to substances flying through the air as dust. In addition to this typical late form of hay fever which is due to ragweed there is the early form of hay fever which is due to the pollen arising from the various grasses and from certain flowers. The early form is rather more compli-

cated than the late form and the skin test is of considerably greater use in diagnosis for the reason that the periods of pollenation of these various grasses overlap one another to a large extent and since any one particular agricultural season may be a week or two ahead or behind the normal, it is practically impossible to identify from the history alone the particular plant producing the trouble. Suffice it to say that typical cases of early hay fever are due to the pollen of either timothy, June grass, orchard grass or red top hay and begin within a week of June first and last until within about a week of July 10th. In a few cases typical seasonal summer hay fever is due to the pollen from various flowering plants such as roses, daisies, cosmos, nasturtium, phlox, primrose and others.

In addition there is a much earlier group of hay fever patients who have their symptoms in early May, although of only short duration. In such cases, the trouble comes from susceptibility to the pollen of some of the early flowering trees, such as the willow, birch, maple and oak. In these cases too the exact diagnosis is made only by the skin tests although very often if the patient's house is surrounded by a number of trees of one particular variety, as for example, horse chestnut, and if at the same time the patient has relief when staying at another house in the neighborhood, it may be possible to conclude with some certainty that the pollen of the horse chestnut trees is responsible, and this is particularly the case if it is known that the symptoms began at nearly the same time that the pollen from the horse chestnut trees was first given off.

Seasonal hay fever depends practically always upon a susceptibility to the pollen of some plant. When once the diagnosis is made, the method of treatment is at once clear and the patient can either leave the neighborhood, or can be treated by means of extracts of the particular pollens responsible.

Vasomotor Rhinitis.—There is a large group of cases who have "hay fever" throughout the year. This perennial vasomotor rhinitis is closely allied to hay fever so far as the symptoms and the appearance of the nasal mucous membrane goes. In about one-fifth of these cases the cause is some foreign proteid such as wheat flour dust, orris powder, rice powder, and the animal danders, for example, horse, dog and cat, etc. Often there seems to be some peculiar and usually unidentified dust or odor such as is found in musty farm

houses or in other special circumstances and places, which is responsible. At times the history is perfectly clear. A man travelled to Europe on his honeymoon. He had an attack of vasomotor rhinitis together with some asthma for the first time in his life on the ship going over and had a very brief attack one night in London and another attack one night in Paris. It developed that he was sensitive to orris powder, and his history brought out the fact that when the suitcases were first unpacked in the stateroom, orris powder was spilled generously over the floor and hangings. The attacks in London and Paris both occurred on nights of dinner-parties when his wife used orris powder in her toilet.

In the vast majority of these cases, however, and in spite of a very careful history and of a very complete series of tests, no foreign proteid or other substance can be identified. These non-sensitive cases are often found to have some definite abnormality in the nose or sinuses, the correction of which is usually followed by relief from symptoms. The history here will usually, as might be expected, be one of continuous trouble without relations to climate, place or occupation.

Asthma.—In about one-third of the cases of true hay fever there is superimposed on the symptoms in the nose and throat, symptoms referable to the chest characterized by difficult and wheezy breathing which comes on particularly at night. This symptom of wheezy breathing is called asthma and since in most of these cases, asthma is limited to the hay fever season and since like hay fever it is much relieved by change of climate as well as by specific treatment, it also is undoubtedly caused by the same susceptibility to pollens and thus represents simply an aggravated form of hay fever.

This pollen asthma is perhaps the simplest form of asthma known. Simple both as to diagnosis and treatment.

Let us for a moment consider asthma in general. There are two great groups of causes. An attack of wheezy and difficult breathing may result from contact with certain foreign substances occurring in dust which the patient inhales and to which there is a definite susceptibility, or it may occur after the ingestion of certain foods to which the patient is also hypersensitive; on the other hand, an attack—usually a series of attacks—may be due to some abnormality or pathology within the patient's body.

Extrinsic asthma embraces the great group whose symptoms are due to a susceptibility to foreign substances and comprises about 40 per cent. of all the cases of asthma. Extrinsic asthma as we have already seen includes pollen asthma together with horse asthma, asthma dependent upon the dust of feathers and a variety of other dusts. Extrinsic asthma includes also a considerable group of children who are susceptible to certain kinds of food, eggs being usually the chief offender. This form of asthma, regardless of the cause, usually begins acutely, the attack lasts only for a short time following exposure unless of course the exposure is repeated, and the attack usually ends abruptly when the offending substance has been removed. The attacks, then, always bear a very close relation to exposure to the dust in question. Individuals with horse asthma have trouble only when in close contact with horses, as in driving or riding, although in certain cases the susceptibility is so delicate that even walking through the congested city streets will bring on an attack from the numerous horses met with.

Food asthma is especially important in children. The typical child will have violent asthma coming on within a few hours, or in certain cases, minutes, after eating egg white and this asthma will last for at least twenty-four hours and usually is associated with vomiting and often with urticaria. In adults food asthma is rare and yet the cases are typical and striking: A physician of 28 was seen two years ago whose sensitiveness to fish was so exquisite that the slightest trace of fish used in cooking or in his food caused immediate vomiting with prompt appearance of urticaria and asthma. Furthermore if he licked a postage stamp the fish glue made his tongue and mouth swell to an uncomfortable degree.

As has been said, each one of these forms of extrinsic asthma ends abruptly when the contact with the particular substance ends. Very often, however, a bacterial infection is superimposed on top of the primary asthma and such cases have *complicated asthma.* This is particularly seen in pollen asthma. In certain cases the asthma aggravating hay fever does not end with the pollen season, but continues on in a severe form for several weeks beyond the customary limit and during this asthma the patient may notice that his sputum is more profuse and thicker than it ordinarily is with his uncomplicated pollen asthma. In such cases the prognosis is fairly good and the

results of treatment during the following year are extremely satisfactory, but on the other hand it quite often happens that a second attack of asthma occurs later in the winter which obviously is due solely to bacterial action and depends upon the fact that the tendency to asthma still exists and manifests itself during any attack of bronchitis. It is not infrequent that such a case is seen in midwinter, say in February; the relation between the symptoms and plant pollens would at that time seem hard to understand and might easily be overlooked and yet unless the underlying basis of pollen sensitiveness is recognized, the patient will suffer unnecessarily from the lack of proper and adequate treatment during the following summer and fall since this treatment would be of definite value in preventing the further development of asthma from the stage of recurrent attacks through the stage of chronic persistent asthma without emphysema to the development of typical secondary emphysema and its associated bronchiectasis.

Skin tests are by no means essential to the study and treatment of all cases of asthma for the reason that it ought in many cases to be possible to discover from the history alone whether it is likely and reasonable that sensitiveness to one or another foreign substance could explain the patient's symptoms. If skin tests are done and positive reactions are obtained, the next step is always to determine whether or not these positive skin tests are important or represent merely a vestige of outgrown sensitiveness. For this purpose the history is all important, but in addition and by clinical experiment the supposedly offending protein can be either excluded from the patient by change of environment or diet or else it can be given him in large doses to test its effect.

Urticaria.—Theoretically, urticaria should fall into the same disease group as hay fever and asthma. This is because urticaria is a common complication of asthma and occasionally of hay fever and furthermore like asthma, urticaria is one of the important signs of serum disease in man. In many cases, notably after the administration of foreign serum in the form or diphtheria antitoxin, the relation between urticaria and foreign proteins is perfectly clear and distinct.

During the past three years the author has examined thirty-five cases of urticaria, but unfortunately proteins have been identified as

causative factors in only 17 per cent. The result of this study was distinctly disappointing, but that this result is probably correct is shown by the fact that most of these patients have been already advised to make radical changes in their diet as well as in their whole life by travel or otherwise and except in a few cases these changes have not brought about any material relief. That occasionally individuals are found who are "poisoned" by such foods as strawberries, cantaloupe, various kinds of shell-fish or by nuts and other foods, is well recognized, but here the etiology is so striking and so definite that these persons rarely become patients. By avoiding the particular substance they live in comfort and require no treatment.

Eczema.—Here the story in adults is very much the same as in the case of urticaria. Careful study has been made of forty cases, but with positive results in only twelve patients in whom, however, the positive reactions found did not lead to any therapeutic measure which could bring about relief. On the other hand with eczema in children the story is quite different. Doctor Schloss in New York and Doctor O'Keefe in Boston have made a special study of this subject and have found that over 40 per cent. of children so afflicted are susceptible to one or more foods, and furthermore, they find that the elimination of the food from the child's diet often brings about a definite relief. They have studied infants by this method and have found that the infant may be susceptible to certain foods which are included in the mother's diet and that by changing the mother's diet, the eczema in the infant has been relieved. This work is substantiated by two experimental studies in one[2] of which, abnormal and undigested proteins have been found in breast milk, and in the other[3] of which, the foreign protein (egg white) has, by means of the precipitin reaction, been found in the blood of these infants.

Other Conditions.—So far, a discussion has been given of those clinical conditions closely related to the general picture of human sensitization. There are other conditions less well studied, some of which are of "functional" type and are characterized by fairly clear-cut attacks. Such conditions include cardiospasm, migraine, par-

[2] SHANNON, W. R.: "Demonstration of Food Proteins in Human Breast Milk by Anaphylatic Experiments in Guinea-pigs," *Am. Jour. Dis. Child.*, 1921, xxii, 223.

[3] SCHLOSS and WORTHEN: "The Permeability of the Gastro-intestinal Tract of Infants to Undigested Protein," *Am. Jour. Dis. Child.*, 1916, ii, 342.

oxysmal tachycardia, and sometimes forms of abdominal pain. All of these begin without obvious cause and end quite suddenly leaving the patient apparently as well as before. It is readily conceivable that some article in the diet to which the patient was hypersensitive forms the basis of these attacks. While this is easily possible and while our present methods may no doubt be faulty and inadequate, yet the fact remains that many of these patients have been tested with all the materials available and yet without results beneficial to the patient.

There is another aspect of this whole problem which is certainly of scientific interest if not of immediate and obvious clinical significance. It has been shown by Longcope[4] as well as by T. H. Broughton[5] that repeated anaphylactic shock caused by repeated injections of foreign proteins in animals will ultimately lead to very definite pathological lesions in the kidneys as well as in the heart, liver and other viscera. These observations suggest that repeated attacks of hay fever or of asthma are not without the danger of producing in the patient some chronic organic disease. In view of the fact that these experimental observations are so clear cut, it is perhaps remarkable that such chronic changes are not more often seen in patients with hay fever, asthma, etc. But whether repeated attacks of hay fever render the individual more susceptible to chronic nephritis or not, every effort toward the prevention of these attacks should be made.

Natural vs. Artificial Sensitiveness.—Hay fever, asthma, urticaria, etc., represent examples of natural susceptibility. The symptoms exhibited are often quite the same as the symptoms exhibited by animals as well as by patients who are artificially sensitized. The reaction which occurs after a large dose of foreign serum in the form of diptheria antitoxin or antipneumococcus serum, and characterized by urticaria, is of course, exactly comparable to the spontaneous form of urticaria. The insufflation of the lungs which occurs in guinea-pigs, dead of acute experimental anaphylactic shock, is entirely comparable to human asthma in its symptoms and path-

[4] Longcope, W. T.: "The Relationship of Chronic Protein Intoxication in Animals to Anaphylaxis," *J. Exp. Med.*, 1915, xxii, 793.

[5] Broughton, T. H.: "Kidney Lesions in Chronic Anaphylaxis," *Jour. Immunology*, 1916, 1, 105.

ology and indeed this latter comparison, first discovered by Meltzer,[6] is the connecting link and the foundation on which the whole application of experimental anaphylaxis to human disease has been built. Further study, however, in recent years has shown quite clearly that although there are evident similarities between the two conditions, yet there are also several gross differences.

In the first place natural sensitization is shown not only to proteins, but also to other non-proteid substances including many drugs and other dusts, odors or foods with which the individual comes in contact perhaps in the course of his employment. Such for example is the susceptibility to procain acquired by dentists[7] or the susceptibility to ipecac and quinine acquired by drug clerks. Secondly, natural sensitiveness is practically always multiple. The individual is for example sensitive not only to horses but may be slightly sensitive to cats and even to food substances like wheat, all at the same time. In the experimental animal this is never the case since one of the characteristics is that the sensitiveness here is exquisite, single and highly specific. From the laboratory point of view there is a third striking difference, namely, that whereas in the experimental animal, antibodies to the specific protein can be demonstrated in the blood by a precipitin test as well as by the ability of the blood to transfer the highly sensitive state to a second animal, yet, in spite of many attempts to demonstrate antibodies in the blood serum of hay fever patients and of asthmatics, these attempts have succeeded in only a very few of the total number, so that here is a definite and striking difference between the two groups of conditions. Finally in experimental anaphylaxis recovery from shock results in a refractive period; that is in "desensitization" which lasts for at least a week or two. In natural sensitization, severe reactions occurring during the treatment of horse asthma or of hay fever do not protect the patient against a second severe reaction in case a similar dose of the protein substance is injected perhaps on the following day.

There is but one more point worth emphasis. Some individuals are naturally sensitive not to horse hair but to horse serum. They

[6] MELTZER: "Bronchial Asthma as a Phenomenon of Anaphylaxis," *Trans. Assn. Amer. Phys.*, 1910, xxv, 66.

[7] LANE, GUY C.: "Occupational Dermatitis in Dentists: Susceptibility to Procain," *Arch. of Dermatology and Syphilology*, 1921, iii, 235.

may suffer from asthma or not. They may know of this sensitiveness, but usually do not. The sensitiveness to horse serum may have been acquired artificially during a previous attack of diphtheria when they were given antitoxin or it may have arisen spontaneously. The existence of such a susceptibility undoubtedly accounts for the occasional fatal results occurring suddenly after the administration of diphtheria antitoxin or other horse serum.

It is very simple to recognize this susceptibility in advance. If a small drop of the diphtheria antitoxin or other foreign serum about to be administered is injected between the layers of the skin, and the local reaction is then observed for a period of fifteen minutes, susceptibility will show itself by the production of a definite urticarial wheal at the site of inoculation. In the presence of this wheal the subcutaneous and especially the intravenous injection of any considerable amount of the same foreign serum is absolutely contraindicated. This test takes only fifteen minutes, is very easy of application, and in ninety-nine cases out of one hundred will be negative. The results in the one case, however, will more than justify its routine use before the injection of any foreign serum.

Medicine

SOME DISEASES WITH INCREASED MOVEMENTS (DYSTONIAS)

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Diseases with the symptoms of increased movements or hyperkinesis have been observed for many years. Among such movements may be mentioned tremors, athetosis, certain spasms not of pyramidal tract origin, choreiform movements, torsion spasms, etc. Although the mechanism of loss of movement or paralysis is well known, that of increase of movement remains obscure.

When Wilson, in 1912, described a disease which he terms progressive lenticular degeneration, he stimulated investigation of a group of diseases which had been regarded as separate clinical entities. The results of recent investigation tend to group these diseases into the disorders of the lenticular nucleus.

In 1916 Spiller assembled the various disorders attributed to disease of the lenticular nucleus; these were the pseudosclerosis of Westphal and Strümpell, Huntington's chorea, Parkinson's disease, spastic pseudo-bulbar palsy with contractures and choreo-athetoid movements of Oppenheim and Vogt and Freund and Vogt, dystonia musculorum deformans of Oppenheim, and double athetosis. To this list he added von Bechterew's hemitonia apoplectica and certain forms of carbon monoxid poisoning. Recently he added a certain type of myoclonus resulting from lethargic encephalitis. Strümpell takes a similar position in describing the amyostatic symptom complex in which most of the above-mentioned conditions are included and in addition certain cases of arteriosclerotic muscular rigidity. Jelliffe has added tuberous sclerotic idiocy. Thomalla discussed the resemblance between bilateral athetosis, pseudosclerosis, progressive lenticular degeneration and torsion spasm. He proposes for the whole group the

name of dystonia lenticularis, which appears to be the most comprehensive and fitting term so far suggested.

The physiology of tone remains obscure and its disturbances are not well understood. Most of our explanations are theoretical and conjectural. We can only say that when certain parts of the central nervous system are destroyed, certain changes in tone occur. It can further be stated that these disturbances occur when the pyramidal motor system seems to be intact. Therefore, there must exist an extrapyramidal system for maintaining tone. Whether tone is a fundamental cerebellar function is not known. Mills says that: "The three essential qualities of motor innervation are energy, tone and synergy. Tone is necessary for the rhythmetization both of voluntary and involuntary movement; synergy in order that toned movements shall be grouped for the performance of acts which require special adjustments. Tone integrated in the striatum unites with cerebellar synergy through the intermediation of the cerebello-rubro-thalamo-cortical apparatus and the cerebello-rubro-spinal apparatus. If the cerebellar influence is withdrawn, asynergic movement is the consequence. If the tonectic excitations from the striatum are withheld, hypertonicity and involuntary movement result." He thinks that tone belongs to the cerebral cortex and has special cortical areas of representation. Regarding the frontal cortex from the central fissure to the anterior pole of the brain as subdivided into a prefrontal, a midfrontal and a postfrontal (motor) region, the cortical tonectic zone is chiefly midfrontal; the striatum is an association or integration region, bearing the same relation to the midfrontal area of the cortex as the fronto-insular speech centre bears to the primary and secondary cortical visual and auditory centres.

If, as Mills contends, tonic innervation is supplied to the pyramidal system and exhibits itself through the activities of this system it is clear that for normal rhythmetization of movement the pyramidal tract itself must be intact. Mills recently has called attention to the interference with normal tone innervation resulting from pyramidal lesions and explains on this basis various aberations of muscle tonicity in general (hypertonia, hypotonia and dystonia) occurring in organic hemiplegia. Assuming the validity of the localization of the cortical tonectic apparatus in the midfrontal region, clinical cases supporting

this must be present. Reports of such cases are not numerous, but are not lacking.

Tending to support this contention are the observations of Leipmann on tonic perseveration and Wilson and Walshe on tonic innervation. By this they mean the inability owing to a central lesion to relax innervation in any muscular group or groups, or that kind of innervation of muscle groups which persists in spite of the patients' endeavor to inhibit it, as in the inability to relax after grasping objects or closing the hand. In two of Wilson's and Walshe's three cases large endotheliomata of the frontal lobes were found on operation. They mentioned a number of cases reported by Steinert, Van Vleuten, Kleist, Kurt Goldstein, Kroll, Coriat, Rhein, Campbell and Pick. They draw analogies between tonic innervation and mytonia congenita, holding that "as far as the actual symptom of inability to relax is concerned no clear or unequivocal distinction can be drawn between its manifestation in the latter of these conditions as opposed to the former." Mills is of a like opinion. Similar to this phenomena but occurring in extrapyramidal disease of different localization, is Westphal's paradoxical contraction which occurs in pseudosclerosis and Parkinson's disease and consists of the fixation of the passively dorsally flexed foot, a manifestation of fixation rigidity. Hunt has described a sign occurring in dystonia musculorum deformans consisting of inability to plantar flex the foot when in a state of dorsal spasm with an increase of dorsal spasm on the attempt.

Schwab offers as clinical evidence in support of the contention of the cortical localization of tonus the presence of a phenomena which he terms intentional hypertonia which was observed in five cases of cortical disease in children. He means "muscle groups which in a state of flaccidity or semi-flaccidity show to palpation no spasm or contracture whatever, when they become the subject of intended movement associated with emotion or desire, show incontestable evidence of hypertonia, just as hypertonic muscles are seen as the result of resistance movements. There is, therefore, over-action, adductor attitudes, flexor over-action at the elbows and all the phenomena which accompany innervation, both as to gait, attitude, facial expression, etc. Van der Scheer and Stuurman although agreeing with Kleist in the assumption of a theory for a tonic coördinating apparatus by an afferent and efferent reflex, likewise assume that

the tonectic cerebral apparatus in the cortex may be injured so as to bring about such disturbances as forced attitudes, in frontal cortical lesions, tonic symptoms and cerea flexibilities in certain psychoses. These, of course, are the conditions found in catatonia.

It is the purpose of this clinic to briefly describe and illustrate some of the diseases which occur as the result of lesions in the corpus striatum; their exact symptomatology varies as to the precise fibre tracts or synaptic junctions which are located in or pass to or from the striatum region affected.

In 1912 Wilson described a disease with which the medical profession was unfamiliar. He found that the total number of cases of the disease that had been published amounted to six. Of these two were reported by Gowers in 1888 under the name of Tetanoid Chorea associated with cirrhosis of the liver, one by Ormerod in 1890; and three (two brothers and a sister) by Homen in 1890. A very doubtful case was reported by Anton under the title of Dementia Chorea Asthenica in 1909.

He reported four cases personally observed and the record of two other cases described by Gowers but hitherto unpublished. From a study of these twelve cases he described a clinical entity which he terms progressive lenticular degeneration.

Progressive lenticular degeneration may be defined as a disease which occurs in young people, which is often familial but not congenital or hereditary; it is essentially and chiefly a disease of the extrapyramidal motor system and is characterized by involuntary movements usually of the nature of tremor, dysarthria, dysphagia, muscular weakness, spasticity and contractures with progressive emaciation. With these may be associated emotionalism, and symptoms of a mental nature. It is progressive and, after a longer or shorter period, fatal. Pathologically it is characterized predominantly by bilateral degeneration of the lenticular nucleus and, in addition, cirrhosis of the liver is constantly found, the latter morbid condition rarely, if ever, giving rise to symptoms during the life of the patient.

The average age of onset is fifteen. Of his twelve cases seven were males and five females. One fact should here be mentioned. The patients before the onset of the disease were of normal mental and physical development.

Two clinical types may be distinguished. One acute or subacute

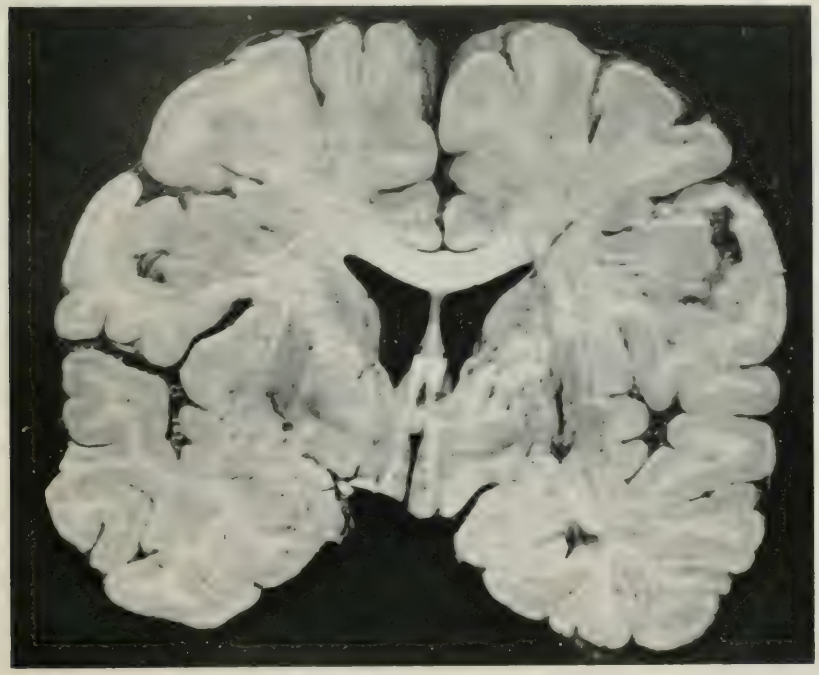
and the other chronic. The former is associated with some febrile disturbance.

The most striking symptoms are due to disturbances of motor function. Tremor is one of the outstanding features of the affection. It is a true tremor, regular, rhythmical alternating contractions of a given muscular group and its antagonists, the rate is variable, from four to eight a second; it is increased by excitement or if attention is drawn to it or by voluntary effort. In most cases the tremor is more evident peripherally than proximally. The range of the tremor is usually fine, at least at the beginning. With volitional movement, the excursions become wider and as the disease progresses it becomes worse and worse. Everyone of the cases has been characterized by the presence of rigidity or spasticity, which is steadily progressive and has frequently assumed an extreme degree. In advanced cases the face is fixed, expressionless, or smiling stiffly; it has been noted as fatuous or silly, the head and neck are fixed, rigidity of the trunk is present. As a rule, the hypertonic muscles are the flexors. But as far as can be seen, there is a generalized condition of increased tone in all the muscles indiscriminately, the only muscles that do not appear to be implicated are the extrinsic ocular muscles. It is but a step from rigidity to contracture and these are constant features of the disease. They begin usually in the distal segments of the limbs. At first the process is due only to fixation of a limb in a particular position from hypertonicity of the musculature, but this is followed by true myogenic contracture. Dysarthria was present in every case and resulted in more or less complete anarthria, the patients being unable to articulate intelligently a single word or syllable. It is characterized by the slurring element without the scanning of multiple sclerosis. The greatest difficulty is with certain consonants. Dysphagia is as constant as dysarthria and in a majority of cases comes on simultaneously. In spite of the tremors, rigidity and contractures in the majority of cases, a considerable degree of voluntary power remained. Muscular weakness, however, is one of the symptoms of this disease, but it is in no sense a paralysis nor has it to do with the pyramidal tract. There are no sensory symptoms in pure lenticular disease. The deep reflexes are active, but not exaggerated; there is no ankle or other clonus. The abdominal reflexes are present and the plantar reflexes show a normal response. Of mental

symptoms, they may consist of narrowing of the mental horizon, docility and childishness. They are easily tickled and pleased and seem unable to deliberate or pass judgment. There is no nystagmus. The optic discs are normal, pupillary reactions are normal. There is no fibrillation or localized amyatrophy and no cerebellar symptoms.

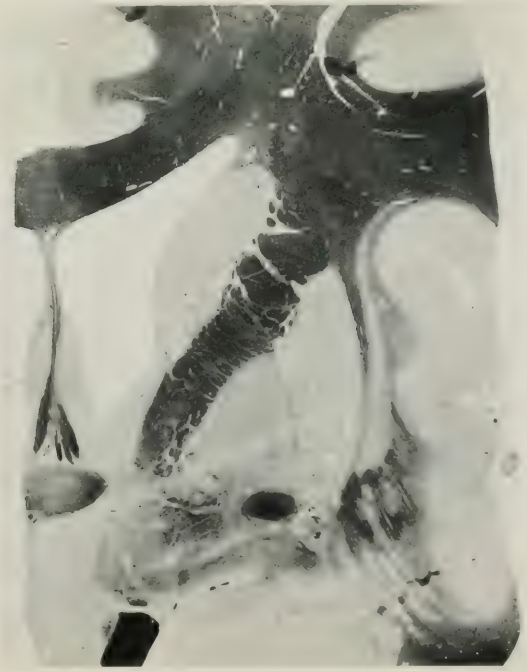
The symptoms may be noted from the description of the case observed by me. It occurred in a man aged twenty-two, a railroad fireman, who was admitted to the hospital complaining of a tremor. The illness began two years prior to admission with a slight tremor of the right hand which gradually spread to other parts of the body, involving all extremities. The tremor was inconstant, it disappeared at rest, when the patient was lying down, and when he was apparently unobserved. It appeared immediately upon any voluntary movement and increased in intensity upon sustained effort. It was coarse in nature, having 3.5 to 4 oscillations per second and consisted of movements of large amplitude at times to become riotous. The movements were rhythmical alternations of contractions of antagonistic groups of muscles. The tremor was frequently induced by associated movements and emotional disturbances. It could be stopped temporarily on passive change of position and at times by voluntary change. Slapping the extremity in which the tremor was present did not stop it. When observed lying in bed the legs were in continuous motion; internal and external rotation, adduction and abduction of the thighs producing the larger proportion of movement. With slight flexion of the legs, the heels resting upon the bed, there were seen flexion and extention of the ankles and legs and lateral movements of the feet. These movements resembled a clonus. The hands were semiflexed and a tremor suggestive of "pill rolling" was seen. On sustained shrugging of his shoulders, anterior and posterior and slight lateral rhythmical movements of the head appeared, becoming very marked upon bending of the head backward. Upon standing, a continuous movement of the legs was observed. He walked with a marked tremor of the whole body, strutting like a mechanical doll. A general increase in muscle tone was observed. The deep reflexes were variable, the superficial reflexes were conserved and no pathological reflexes were present. Sensation was normal. The patient was irritable and fault-finding, easily aroused to laughter and given

Fig. 1.



Coronal section of brain showing gross lesions in lenticular nuclei.

Fig. 2.



Coronal section through basal ganglia at posterior extremity of anterior commissure, showing degeneration of ansa lenticularis.

Fig. 3.

Liver showing nodular cirrhotic changes.

Fig. 4.

Cross-section of liver, showing similarity to Laennec's cirrhosis.

to attempts at witticisms. There was a dysarthria with slurring, but no scanning or explosive speech. There was a distinct ring of olive-greenish pigmentation about the sclero-corneal junction. Because of persistent abdominal pain he was operated upon and his gall-bladder drained. After a stormy febrile course he died. At autopsy there was found, among other things, a fatty Laennec cirrhosis of the liver and a bilateral lenticular degeneration extending from in front of the anterior commissure backward for a distance of 1.5 centimetres, localized chiefly in the putamen.

The pathology of the disease in those cases examined carefully is quite characteristic. A bilateral symmetrical degeneration of the putamen and globus pallidus is seen. Various degrees of this degeneration are found from discoloration, and sponginess, through shrinkage and atrophy, to complete disintegration and excavation of the ganglion. The neighboring structures are involved to a much less extent. The optic thalamus is practically always normal and the internal capsule is intact from end to end. The caudate is often rather shrunken, but never disintegrated. Sometimes the external capsule is degenerated mainly in its middle or posterior third. Apart from the degeneration in the lenticular nucleus, the changes in the brain are negligible (Fig. 1).

The microscopic change in the lenticular nucleus consists of glial overgrowth, which afterward disintegrates and breaks down. There is often an immense increase in glial nuclei. The nerve fibres and nerve cells of the normal nucleus disappear. Kornchenzellen and macrophages are frequently present. The pons, medulla and cord are uniformally negative. This is also true of the nerves and muscles. In advanced cases there is degeneration of the ansa lenticularis, relative atrophy of the corpus Luysii, partial degeneration of the lenticular bundle of Forel and of the strio-Luysium fibres and degeneration of striothalamic fibres (Fig. 2).

The liver is always cirrhosed, from hepatitis. It is always advanced, firm, hard, and presents the appearance of rounded nodules of liver tissue clustered together, of the size of hazel-nuts or larger, separated by depressed cirrhotic bands. Microscopically are found normal areas, necrosed areas, fattily degenerated areas and actively regenerating areas scattered irregularly through the organ. In some places the cirrhosis in monolobular and occasionally signs of intralo-

bular cirrhosis are present. The thyroid showed regressive and proliferative changes (Figs. 3 and 4).

The disease is always fatal, the average duration of the acute cases is about seven months; of the chronic, four years. The treatment is purely symptomatic and palliative.

Pseudosclerosis was first described by Westphal in 1883 and later by Strümpell. The features of this disease are:

1. Tremor of the distal parts of the limbs, more or less rhythmical, bilateral, of small amplitude and increased by excitement and attention. In long-standing cases the tremor occasionally appears as tonic, clonic spasms, ceasing during complete rest.

2. Rigidity of the limbs involving especially the flexors, but also the face, trunk, bulbar muscles (dysarthria, dysphagia), exceptionally of the ocular muscles. The rigidity is shown by the slowness of movement, contracture-like resistance to quick passive movements and contracture positions without true contractures.

3. Slow, scanning, nasal speech.

4. Cirrhosis of the liver which seldom causes symptoms.

5. Pigmentation of the cornea of a brownish-green color.

6. Psychic disturbance consisting of irritability incident to acts of violence, failure of intelligence and progressive dementia.

Negatively are preserved, muscular power, integrity of sensation and the vesico-rectal, genital functions, absence of muscular hypertonia with changes in the tendon reflexes, of nystagmus and optic atrophy.

In Bostroem's analysis of twenty-five cases of pseudosclerosis, the age of onset varied between the tenth and twentieth year, the latest being the twenty-fifth year. The duration was from one to twelve years.

A study of the cases which have been reported shows that under the title of pseudosclerosis we have had to deal with a number of types of this disease and probably in many instances examples of other conditions. The greater part of these cases if examined by modern methods would probably show pathological changes chiefly in the lenticular and striate nuclei. The presence of widespread changes in other parts of the brain makes it necessary to attempt to group these cases more carefully.

Several cases are now on record where the condition has been

generally accepted as pseudosclerosis, in which the autopsy has revealed a definite lesion of the lenticular nucleus. Although not greatly marked, as has been found in progressive lenticular degeneration, the findings of V. Hosslin and Alzheimer in their case are those of definite changes of typical localization.

The resemblance between this condition and progressive lenticular degeneration is striking and Thomalla refers to both as the Westphal-Strümpell-Wilson syndrome.

Oppenheim places the pseudosclerosis and Wilson's disease in one group. Strümpell regards Wilson's disease as a type of pseudosclerosis and Wilson himself now regards his disease to be nearly related to pseudosclerosis. Rausch and Schilder regard Wilson's disease as a special form of pseudosclerosis. The resemblance between the two diseases is shown in that one brother reported by Higier had the Wilson type and the other brother the pseudosclerosis type of the disease.

Cadwallader in reporting three cases resembling pseudosclerosis and progressive lenticular degeneration concluded by saying that considering both the clinical and pathological evidence now at our disposal it would seem not at all unlikely that in the near future pseudosclerosis and progressive lenticular degeneration may be proved to be merely modifications of the same disease.

Hamilton points out the fact that the more the cases are multiplied under these two headings the more difficult does the distinction become.

Thomas in a report of three cases in one family which differ in several respects from the typical picture of Wilson's disease, mentions the prediction that similiar cases will be found to belong to a group of diseases of the lenticular nucleus, which show considerable variation in clinical manifestations. This prediction coincides with the opinion of Strümpell who has collected the several symptoms referable to diseases showing interference with tone into a complex which he terms the amyostatic symptom complex. In pseudosclerosis it consists of tremor chiefly, rigidity, hypertonic contractures, walking on the toes. In Wilson's disease tremor, muscular rigidity, muscle fixation, etc.

Strümpell says that the amyostatic symptom complex occurs in cases of different diseases, which are apparently very closely related

to each other in an anatomic physiologic sense, although they may present great differences from the etiological standpoint. From this standpoint the infantile or juvenile, frequently hereditary or familial types, are different from the forms which appear in older persons. We have on the one hand the so-called pseudosclerosis, Wilson's diseases, etc.; on the other a disease picture which is related to paralysis agitans. Many of the cases known under the name of juvenile or hereditary paralysis agitans probably belong to the first group. In the two cases the disease pictures are classified according to the predominance and grouping of the single symptoms. The symptoms to be considered are, first, the tremor and athetoid movements; second, the muscle rigidity (static muscle rigidity) with its accompanying symptoms (contractures, clumsiness, etc.); third, speech disturbance often in connection with dysphagia; fourth, psychical disturbances, slowly progressing dementia; fifth, the accompanying liver disease and pigmentation of the cornea.

Familial infantile types occur with tremor, muscle rigidity, speech disturbance, liver disease and corneal pigmentation and, on the other hand, types in which muscle stiffness predominates almost without tremor, or dementia, and without a pigment ring on the cornea. In the case of diseases which appear in older people we have a typical paralysis agitans with tremor and muscle rigidity, but without special speech disturbances or dementia. Besides cases of so-called paralysis agitans sine agitatione, there is arteriosclerotic muscle rigidity, etc., with predominating muscle rigidity and often with dementia.

In the case which is here illustrated which had been diagnosed as juvenile paralysis agitans on several occasions, it was the tremor and rigidity which led to such a diagnosis. The marked asymmetry of the involvement, and lack of conformation to type of the muscle rigidity, the extent of the tremor all speak against paralysis agitans, as the chronic course, absence of emaciation and dysphagia, speaks against the inclusion of the case with a categorically defined Wilson's disease.

A. J., female, aged 33 years, single.

Family History.—Father and mother living and well; no brothers; three sisters living and well; no brothers or sisters dead. No organic illness in the family and no history of any similar affection. No sick headaches in the family; no history of arteriosclerosis or nephritis.

Personal History.—Menstruation began at 17-18; irregular until operated

upon for appendicitis at nineteen, since then regular. There is a history of scarlet fever twice—the first time at eight or nine and the second at twelve or thirteen. No other illness. Probably at the age of fifteen but definitely being present at the age of seventeen the patient noticed a slight rigidity of the left side of the body, with dragging of the left foot in walking, and the assumption of a constrained, tense attitude of the left upper extremity in which the forearm and wrist were peculiarly flexed, the fingers flexed and the thumb adducted. There was a gradual increase in rigidity and tension and at the same time there was noted a tremor which gradually increased in intensity. The tremor was involuntary and as a result of it she frequently spilled things. About five or six years ago the condition began to be apparent in the right side of the body with a tremor of the arm and hand and some rigidity. At the same time there was noticed some difficulty in speaking, considerable shakiness, and difficulty in enunciating words. At times difficulty in swallowing was present. Throughout the illness there has been a tendency toward crying easily and in later years to considerable depression. The condition progressed so that eight or nine years ago she gave up her work as a dressmaker. For the last two or three years she has not gone anywhere because of the difficulty in walking and tension in her body. At times she complains of hot flushes throughout the body.

Examination.—Reflexes—Achilles jerks about equal, variable and brisk; the knee-jerks very brisk and equal, but the lower extremities are held in a state of marked tension, so that the reflexes cannot be obtained in a state of relaxation. When obtained by pressing the patella downward with the index finger and striking the finger, the reflexes are about equal, slightly brisk. No clonus is present. The wrist-jerks, biceps and triceps are equal, variable, very brisk, and obtained in a condition of muscular tension. The plantar reflex is quite frank on the right, not so frank on the left, but no Babinski is elicited at any time. There is no Oppenheim and no Gordon; no Chaddock. Front-tap about equal and normal. Abdominals equal and very brisk. Pupils equal and react to light and accommodation. There is a slight ring of a difference in color about the corneal scleral junction which, however, does not amount to a yellow-green pigmentation. Motor movements are negative; passive movements elicit marked spasticity in the left lower extremity, more marked in the distal portions of the extremity; considerable spasticity of the left upper extremity with cog-wheel resistance, the spasticity being more marked in the movements about the wrist and elbow than about the shoulder. Some resistance is present in the right upper extremity and a moderate amount in the lower.

When lying on her back the left leg is rotated internally, the big toe dorsally flexed. The right hand is slightly flexed at the

wrist, the fingers slightly flexed, the forearm flexed. The right arm is adducted, the forearm is flexed, the wrist is flexed and deflected to the ulnar side, the thumb is adducted, flexed and the index finger flexed about the thumb in the position assumed by a small boy in shooting marbles. The other fingers are flexed. The head is held slightly toward the left. The face is somewhat washed out, although she is still able to smile without any forced movements. Ordinarily the face is devoid of much expression. There is present a tremor in the left hand, forearm, arm, head, slightly in the right arm, more in the forearm and hand, in the left thigh, leg, ankle and foot. The tremor is slow, four to five per second, coarse, consists of to and fro movements of moderate amplitude, increasing to considerable amplitude and consists of alternating contractions of opposing groups of muscles, flexion, extension of the forearm, pronation and supination more, flexion and extension of the wrist. This tremor is stopped momentarily on slapping the member affected, increased on associated movements, ceases at the beginning of an intended movement, and upon sustained effort is increased. An attempt is made by the patient to control it by pressing the flexed hand firmly against the thigh or abdomen, or holding it with the opposite hand. Upon the right side the tremor is more easily seen in the individual fingers, where flexion and extension are the chief motions. Alternate contractions in the muscles themselves without movement of a joint may be seen. The tremor apparently begins at the root of the limb. The gait is decidely stiff, hemiplegic, with propulsive characteristics.

Considerable difficulty is seen in the performance of such acts as require the fine movements of the hand, although the beginning of the intended movement is associated with a cessation of the tremor.

There is some difficulty in arising from a sitting position due to the tendency to fall backward. In walking the left arm is held in the position described in the lying position, with the arm abducted, the forearm flexed and supinated, and the fingers in the above described position. The right arm hangs extended rigidly, with the fingers slightly flexed. There is no sensory disturbance, no bladder or rectal disturbance, and the eye grounds are negative. There is no diminution in volumn of the liver that can be made out even with a röntgen examination (Fig. 5).

The administration of hyoscine hydrobromate in doses of 1/100

diminishes the rigidity to a marked extent. Considerable difficulty is experienced in movements requiring diadokinesia with the left and slightly with the right hand. The cranial nerves are negative except for lateral nystagmus when looking to the extreme lateral positions in either direction.

In many respects pseudosclerosis is closely related to Parkinson's disease and particularly to the juvenile form. Hunt, in proposing the syndrome of progressive atrophy of the globus pallidus, stated that paralysis agitans undoubtedly includes a variety of types which are related clinically, but which must present differences in the localization and character of the underlying lesions. In his study an effort was made to isolate a special group of paralysis agitans juvenilis. He concluded that the mechanism which is involved in this disease is a disappearance and atrophy of the large motor cells of the globus pallidus system. Many of the so-called juvenile paralysis agitans are certainly cases which fit into the description of pseudosclerosis. Pure cases have been very few in number. From 1850 to 1910 Willige was able to find only fourteen cases of paralysis agitans with an onset before the age of thirty.

The cause of these disorders is unknown. It is certain that infectious processes may produce lesions in the striatum with similiar symptomatology. In 100 cases of lethargic encephalitis observed by C. von Economo in the 1920 epidemic in Austria, sixty were of the hyperkinetic type. These cases may be myoclonic, choreic or Parkinsonian. This classification might be split up further, but these three conditions constitute the greater number of cases.

The *Parkinsonian syndrome* is a very common sequel to epidemic encephalitis. It may occur with or without tremor. It would seem that many types of the disease in its acute form produce a Parkinsonian syndrome common to all. The syndrome has followed the lethargic as well as choreiform, athetoid, myoclonic and psychotic types. The symptoms of the Parkinsonian syndrome closely resemble true paralysis agitans on one hand and pseudosclerosis or progressive lenticular degeneration on the other. They resemble paralysis agitans in the attitude, festinating, propulsive gait, the lead pipe rigidity with cog-wheel resistance, the tremor, which is slow, frequently "pill rolling" in type and influenced by muscular movements, the mask-like expression, dysphagia, slow speech, increased sweating and sialorrhœa.

They differ in the rapidity and irregularity of onset, in the exaggeration of fixation attitudes, severity of dysarthria and dyphagia, the large range of the tremor which frequently is absent at rest and present only on volition, in the rapid development of inability to stand or walk. In these respects they resemble progressive lenticular degeneration.

The time of onset varies, at times it has been observed soon after the acute illness of epidemic encephalitis. At times it has occurred after an apparent recovery or at least a great improvement. The symptoms do not develop with any regular progress. At times a few days or a week is sufficient to produce a picture resembling a Parkinson's disease of some years standing. Frequently exacerbations with rapid increase in severity of symptoms are seen. There is an extreme degree of helplessness even in the cases showing but little tremor or rigidity. Sialorrhœa with drooling is common and in the sympathetic nervous system, flushing increased sweating, and at times Horner's syndrome. Head tremors are common and at times tic-like movements are observed. As in paralysis agitans, emotional disturbances increase the movements. In my experience the disease when affecting elderly persons is more apt to produce rigidity and when affecting young individuals tremor and marked fixation attitudes. The following case is typical of its kind.

Mrs. F. H., aged 45, whose family history is not pertinent to the disease, has had during the past three years occasional attacks of what has been described as influenza. In December, 1919, she developed severe pains in all extremities. The pains were associated with marked tenderness to pressure. From the onset of the condition she has had a slight elevation of temperature in the afternoon, ranging from 99° to 100° F. Some headache, nausea and giddiness were complained of; occasionally involuntary twitches of the abdominal muscles were present and some jerkings in the legs were observed. During the day she seemed disinterested and complained of feeling tired. During the night she had great difficulty in sleeping and showed marked restlessness. Eight days after the onset she suddenly developed an acute psychotic condition, characterized by visual and auditory hallucinations; she believed there were people in bed with her, that they had stolen her blankets; she saw animals and various faces. At this time she developed a diplopia, difficulty in swallowing

Fig. 5.

Case of pseudosclerosis.

Fig. 6.

Parkinsonian syndrome following epidemic encephalitis, simulating progressive lenticular degeneration.

FIG. 7.

Parkinsonian syndrome following epidemic encephalitis.

and a staggering gait. In a few days motor restlessness increased so that she was in constant motion and with this increased activity the temperature rose to 103° F. in the afternoon. Within a few days she became lethargic and seemed to be sleeping day and night; she could be roused with an effort and when aroused thought process was clear. The acute stage of the disease lasted six weeks, at the expiration of which time the stupor had disappeared and she complained of stiffness and aching in her extremities, poor memory, loss of interest and precipitate urination. When examined during the acute stage she had choreiform movements in all extremities with myoclonic twitchings in the abdominal muscles. The Achilles jerks were absent, there was a paralysis of the external rectus muscle of the right eye. A marked spontaneous counter-clockwise nystagmus was seen and upon attempts to look upward an upward nystagmus was produced. There was a slight weakness in the right side of the face and a cerebellar dysynergia in the right arm. At the expiration of the acute stage of the disease the Achilles jerks had reappeared, the nystagmus had lessened and there had been added a Parkinsonian facies, attitude, tremor and hypertonus. In this stage she remained for several months and at the present time shows a typical Parkinsonian appearance.

Closely simulating the appearance of one of Wilson's cases of progressive lenticular degeneration is the illustration of the following patient, a man aged fifty who eleven months before the photograph was taken had an attack of epidemic encephalitis of the superior polioencephalitic type with fever, somnolence and diplopia. While resting in bed his appearance is indistinguishable from that of a case of paralysis agitans, but it is immediately apparent upon observing his attempts to stand, that the exaggeration of fixed attitudes and gross tremor indicates a localization of pathology somewhat different from a true Parkinson's disease (Fig. 6). In the following illustrations of the Parkinsonian syndrome occurring in young persons, there may be noted the silly grin characteristic of progressive lenticular degeneration combined with an otherwise fixed facial expression. In both, fixation attitudes are extreme and No. 2 is unable to stand alone or walk, drooling is very severe, and both patients must be fed. Frequently instability of emotional reaction is seen manifesting itself by outbursts of crying. (Figs. 7 and 8.)

The choreiform types are likewise common. The pathology of

Huntington's chorea would lead one to place it among the striate body diseases. The association of the choreiform with athetoid types of epidemic encephalitis offers clinical evidence to the end that they are a part of the dystonias lenticularis. Many of these cases present such symptoms that had we not the evidence of a preceding attack of epidemic encephalitis we would be inclined to diagnose them as hysteria. The movements frequently resemble no known condition, are unphysiologic in their combination, and cannot be explained upon the basis of any known pathology. Among such movements may be mentioned continuous slapping of an extremity or the continuous rubbing of the chest wall.

Whether some of the myoclonic types are due to lenticular disease remains to be seen. Certainly, as shown by Bassoe, some of the myoclonic types are associated with a predominance of meningeal pathology. Many of these cases develop the sequelæ of a Parkinsonian syndrome. Some, even while the myoclonus is present, have assumed the attitude of a Parkinsonian syndrome.

Certain speculative questions are aroused relating to the rigidity of these cases. It has been observed that as the rigidity increases the tremor diminishes (Fig. 9). It does not appear to be a very wild speculation to presume that certain of the catatonic types may be Parkinsonian types without tremor and with marked increase in tone. These cases closely simulate the catatonias observed in mental disease with the exception of intact cerebration. When the catatonia is combined with a stupor, catalepsy is very common, although I have seen catalepsy without stupor. It is to disease of the cortical tonectic apparatus that catalepsy and catatonia have been attributed, but I believe that catatonia, at least, may be a lenticular nucleus symptom (Fig. 10).

Two conditions remain to be mentioned and illustrated. Closely related to certain choreiform movements is the condition known as *dystonia musculorum deformans* of Oppenheim, described by him in 1911. This is one of the conditions grouped by Thomalla under dystonia lenticularis. It is sporadic, in a few instances being familial, due to structural alterations of the striatum. It occurs most frequently, but is not always confined to children of the Jewish race, often but not always beginning in childhood. It is essentially a progressive torsion spasm of the trunk and extremities, with clonic,

Fig. 8.

Parkinsonian syndrome following epidemic encephalitis.

Fig. 9.

Katatonia appearing after epidemic encephalitis.

FIG. 10.

Catalepsy occurring in the course of epidemic encephalitis.

Fig. 11.

A case of dystonia musculorum deformans.

Fig. 12.

Dystonia lenticularis beginning as torticollis.

Fig. 13.

Acquired bilateral athetosis is very closely related to progressive lenticular degeneration.

Fig. 14.

A case of acquired bilateral athetosis.

rhythmic movements suggestive of chorea and athetosis. The characteristic feature is the twisting and tilting nature of the spasm, with distortion of the trunk and extremities and bizarre disturbances of posture, gait and station. It is a progressive disease. In the terminal stage there may be involvement of the muscles of the neck. Frequently some difficulty in differentiating it, in whole or in part, from hysteria, exists. The movements are increased on volition, as in standing or walking, and by attention and embarrassment. At times the dystonia becomes generalized and exceedingly violent. In the patient whose photograph I show, it occurred in a native-born Christian at the age of seventeen. The spasm, as it commonly does, involves chiefly the pelvis, producing a violent tilting, from which the name tortipelvis, a condition homologous to torticollis, is derived. (Fig. 11.)

In this patient the disease had a slow onset, with gradually increasing disability. In many respects it resembles hysteria. It is observed that when the patient stands with his right knee flexed, the violent myoclonic jerkings are absent. If, however, he is asked to extend his leg, he becomes greatly disturbed, emotional, has marked sweating, grimaces and immediately there occurs a series of bizarre and grotesque movements chiefly about the pelvis, at times with force sufficient to throw the patient to the ground. These movements are increased by the presence of bystanders when examined or whenever the patient is embarrassed. At times a slight staccato cry accompanies a spasmodic contraction of the muscles of the back. The movements cease at rest, and when asleep. They cannot be controlled, interfere with function and are quite inimitable.

Occasionally one sees cases beginning with torticollis which soon develop violent, rapid, clonic, choreiform spasms in other parts of the body. Such cases are often classified under generalized tics. It would seem that many of them are undoubtedly examples of dystonias. Such is the case here shown, occurring in an Italian woman aged forty-five. The condition has lasted two years. So severe are the movements of the neck that she has worn off all her hair from the back of her head, through friction against the pillow. The spasms involve her trunk and to a lesser degree her upper and lower extremities. They diminish at rest, disappear in sleep and are increased upon volition, attention and embarrassment. She has a

dysarthria and an explosive speech. The condition differs from a chorea in the rapidity and stereotypy of the movements, and from a tic in the absence of a restraining gesture, inability to control the movements even for a moment, purposelessness and inimitability. (Fig. 12.) How closely such a condition is associated with athetosis may be seen from the observation of a case of post-hemiplegic athetosis with torticollis resulting from a cerebral thrombus. The torticollis itself is quite indistinguishable from the ordinary type recognized as a tic.

Acquired bilateral athetosis is very closely related to progressive lenticular degeneration. (Fig. 13.) Wilson has contended that the irregularity of movement and increase of tremor serve to differentiate the conditions; that absence of associated movement is essential to a pure Wilson's disease. Pathological study, however, places this disease in the corpus striatum group. Clinically it has been observed by Strümpell that in two cases, occurring in brother and sister, of a disease resembling progressive lenticular degeneration the rigidity was the most characteristic feature, the tremor being so fine that without careful observation it would have been overlooked, and athetosis was present in both cases in some parts of the body.

This condition is characterized by marked athetosis, with spasticity, and attitudes of contracture in the absence of real muscular change or shortening. There is usually a cross-legged attitude, with flexed knees, talipes varus, flexion of forearms and clinching of hands. Little or no real paralysis is seen, but the slightest volitional act precipitates violent athetoid movements. Speech is difficult, explosive and at times inarticulate. Frequently mental changes of irritability and deterioration occur. Dysphagia may be present. In the case here shown the condition developed at the age of four following some infectious disease. It required about one year for its development and has remained stationary since that time. When at rest no movements occur. The slightest visible attention of others serves to produce violent movements of all extremities; so severe are these movements that the patient has had a brace in his wheel chair whereby he may immobilize his arm. The movements are both choreiform and athetoid. Marked grimacing is present. No paralysis can be demonstrated. He is irritable, has a fair degree

of intellectual process quite compatible with his deprivational deficiencies. (Fig. 14.)

These diseases, then, represent the group of dystonia lenticularis. Their symptomatology is dependent upon the precise involvement of the striatum. Further investigation is necessary to determine of what this consists. There has been pointed out to us a region of the cerebrum which, until recently unexplored, affords opportunity for clinical and pathological study where formerly existed only a crude experimental approach.

THE INCIDENCE OF CIRCULATORY ABNORMALITIES IN YOUNG WOMEN

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The last decade has witnessed great advances in our knowledge of cardiovascular conditions, but much remains to be done and we are still far from an understanding of many of the commonplace circulatory phenomena. Nevertheless, there exists throughout the medical profession to-day a more rational conception of cardiovascular disease than that which generally obtained in the past. This advance in our knowledge has not alone been due to the introduction of methods of precision. The polygraph and the electrocardiograph, as well as other precise methods, have added enormously to our knowledge of certain phases of cardiology and have made possible an understanding of cardiac irregularity. But these newer and more complicated methods never can and never have replaced the ordinary and older methods of careful physical diagnosis, and the information that is alone obtainable from physical examination. The factor that probably has had as much as or more than any other to do with our present altered conception and adjusted viewpoint in reference to cardiovascular disorders, has been the opportunity presented during the late war for the systematic study of the circulation in an unprecedented number of individuals. Those wholesale observations carried out on literally millions of men, have emphasized as never before the occurrence of abnormal physical signs in presumably healthy individuals and the incidence of certain circulatory abnormalities in our population.

It has not been so long since the presence of a cardiac murmur was all that was necessary to brand an individual as a cardiopath, but to-day in view of the experience of this and other nations, based upon the examination of millions of recruits, what clinician would have the temerity to make the diagnosis of valvular disease on the presence of a murmur alone? These examinations which we have seen carried out upon vast numbers of people in the last few years

have profoundly altered our views about heart disease. We have seen hundreds of hearts which exhibited well-marked murmurs, which were able to withstand prolonged and severe strain. On the contrary, we have observed an equal number of hearts that exhibited insignificant physical signs and yet were functionally incapable of withstanding more than minimal effort. To-day the question is not what is the anatomical condition of an individual's circulation, but rather how much work can the cardiovascular system perform without the individual manifesting signs of overstrain?

The work of Cardiovascular Boards, particularly of this country and of England, is now a matter of record, and the results of their observations are too well known to require extended comment. Attention, however, should be called to the fact that these Boards were working largely with presumably healthy young men of military age, and their findings are applicable only to *young* individuals. To attempt to apply their conclusions to individuals over 35 or 40 years of age, leads one into serious difficulties. They were dealing with individuals who for the most part were too young to exhibit the degenerative changes which first manifest themselves at about middle life.

The gain in our knowledge of circulatory disease that accrued from the examination of this immense number of young men, has been well summed up by Conner, who concludes that we have acquired a better appreciation of the normal variations that may occur in the physical signs of the heart; that the frequency and importance of the syndrome known as the irritable heart of soldiers, or effort syndrome, has been forcibly brought to our attention; that the danger of making the diagnosis of mitral insufficiency on the presence and character of the murmur alone has been emphasized again; that there is a great possibility of error if the diagnosis of mitral stenosis is made without the characteristic physical signs of that lesion being present; and finally, that syphilitic disease of the cardiovascular system is extremely infrequent in men under the age of 35.

These conclusions, and most of our other recent information, are based entirely upon the study of young men. No opportunity has ever presented itself for equally extensive study of the circulatory apparatus of young women. The observations of the Cardiovascular Board, and others who have had the opportunity to record their

findings in immense groups of young men, are doubtless in a general way also applicable to young women, but no definite data are available on this latter point. It is not unreasonable to expect that a study of the cardiovascular system of a large group of young women will give results at least somewhat at variance with those obtained from observations on men of similar age. Therefore, if we hope to complete and to round out our knowledge of circulatory disease as it occurs in young individuals, it seems highly desirable to carry out such group studies whenever possible on large numbers of young women.

An opportunity presented itself to make certain observations on the circulatory apparatus of a considerable number of presumably healthy young women, in connection with one of the great public service corporations of the state of Pennsylvania. The analysis of this material forms the basis for this communication. Contrasted numerically with the material studied by the Cardiovascular Board of the Army this group of women seems utterly insignificant. Nevertheless, it is believed that it is sufficiently extensive to make it worth while recording the findings.

The group analyzed consists of the women who applied for employment during the years 1919-1920 to the Philadelphia Division of the Bell Telephone Company of Pennsylvania. Few, if any, of these applicants came from the so-called lower strata of society. As a rule they were representative young women with at least a common school education, who had been reasonably well taken care of in childhood, who enjoyed the comforts of a home, and the advantages of adequate food, but who for economic reasons were constantly under the necessity of earning a living. For the most part they had never been subjected to hard physical strain or laborious occupation. Their ages ranged from 16 to 35 years. Presumably when they presented themselves for employment, they believed that they were healthy and, so far as they knew, were in no need of medical advice or supervision.

The physical condition of those who seek employment with the above-named corporation is determined by a complete and accurate physical examination, made by thoroughly trained and competent physicians. The results are carefully recorded in a uniform manner, along with a brief medical history of the applicant. Because of the character of the physicians who are constantly making these

physical examinations, the records that have been used as the basis of this study are reliable and may be depended upon. It is no exaggeration to say that these clinical records excel in completeness of detail and accuracy the usual histories found in the majority of medical dispensaries that are connected with the larger city hospitals. Furthermore, whenever an examining physician regards an applicant as unfit for employment, that applicant is reëxamined and passed upon independently by one or more other physicians before the rejection is regarded as final. For this reason medical records of rejected cases are especially full and accurate.

The total number of female applicants examined in the year 1919 was 3133. In the year 1920, 4356 were examined, making a total for the two years of 7489. During these two years the total number

TABLE I

Total number of applicants examined in 1919-20.....	7489
Total number of applicants rejected (all causes) in 1919-20..	878
or 11.7 per cent. of total	
Of this number those rejected for cardiovascular disease.....	265
or 30 per cent. of rejections.	
Of those accepted variable functional murmurs occurred in...	132
Total number showing any kind of cardiovascular signs.....	397
or 5 per cent. of the total, 7489	

of these applicants that were rejected for all causes, was 878, or 11.7 per cent. of the total. Of these 878 rejections, the cause for rejection was recorded as cardiovascular in 265, or 30 per cent. of the rejected cases (Table I).

This does not represent the entire incidence of circulatory disturbances among the seven thousand and more woman that applied for employment, because of the 6611 applicants accepted at least 2 per cent. or about 132 exhibited some slight circulatory abnormality. This abnormality consisted as a rule of a transient or variable murmur, most often heard at the base but sometimes at the apex, always, however, systolic in time and unassociated with any other evidence of cardiac disease or with any symptoms suggesting circulatory weakness. These slight murmurs were looked upon as "functional" and the applicants were accepted. Therefore, of the total number of applicants, namely 7489, 397 exhibited some signs or symptoms referable to their cardiovascular system. In other words, slightly over

5 per cent. of this number of young women exhibited some variety of abnormal circulatory phenomena.

Of the 132 applicants that were accepted for employment in spite of the presence of unimportant functional murmurs, no further detailed analyses have been possible up to this time. On the other hand, a complete study has been made of the 265 applicants who were regarded as unfit for employment because of the more or less clearly defined cardiovascular conditions. The present study is concerned chiefly with certain features in relation to this group.

The ages of this group of 265 were as follows: The youngest applicant was aged 16 years; the oldest, 40. Seventeen of the applicants were aged 16 years. Over half the applicants, or 188, were between the ages of 17 and 20; 55 were between the ages of 21 and 30; and only five were in the decade between 30 and 40.

As might be expected, the vast majority of the applicants were single women. Only 16 were married.

In reference to diagnosis, the 265 cases may be grouped as follows: True chronic endocarditis existed in 106, or 40 per cent. The remaining 60 per cent. exhibited a variety of other conditions. Seventy, or 26.4 per cent., showed variable evidence of hyperthyroidism. A condition generally referred to as neurocirculatory asthenia was present in 30, or 11.3 per cent. Hypertrophy of the heart incident to chronic nephritis, was found in only three individuals, or 1.1 per cent. Hypertrophied heart, the result of chronic adhesive pericarditis occurred once, or .37 per cent. Fifty-five cases, which represented 20.7 per cent., were not clear cut and were difficult of classification. For lack of a better term, they were regarded as cases of toxic, infectious, or degenerative myocarditis (Table II).

An analysis of the 106 cases of true endocarditis, in reference both to the lesions and to their probable etiological factors, brings out some interesting data (Table II). Uncomplicated mitral regurgitation occurred in 63 cases. In these 63 cases of mitral regurgitation, chorea was the probable etiological factor in 3. Recurring attacks of tonsillitis, or badly infected tonsils in 37. Acute articular rheumatism in 8. A combination of acute articular rheumatism and tonsillitis in 6. Various other infections in 3. In 6 cases no etiological factors could be determined, and in no instance of mitral regurgitation was epidemic influenza apparently ever a causative

factor. Mitral stenosis alone occurred in 8 individuals. Tonsillitis was apparently responsible for 3 of these cases; acute articular rheumatism for 1. In 2 severe attacks of influenza may have been of etiological importance, and in 2 of the remaining cases no causitive

TABLE II

The 265 cases are divided, *viz.*—

True chronic endocarditis	106, or 40	per cent.	
Hyperthyroidism	70, or 26.4	per cent.	60 per cent.
Toxic or infectious myocarditis	55, or 20.7	per cent.	
Neurocirculatory asthenia	30, or 11.3	per cent.	
Chronic nephritis	3, or 1.1	per cent.	
Chronic pericarditis	1, or .37	per cent.	
Total	265		

Chronic endocarditis is further divided according to lesion and etiology, *viz.*—

Lesion	No. of Cases	Etiological Factor						
		Chorea	Tonsils	Rheumatism	Both	Other Infect.	"Flu"	None
Mitral Regurgitation	63	3	37	8	6	3	0	6
Mitral Stenosis	8	0	3	1	0	0	2	2
Double Mitral Lesions	25	0	9	7	0	3	3	3
Aortic Regurgitation	6	0	2	1	0	0	0	3
Aortic Regurg. and Stenosis	4	0	2	0	0	1	1	0
Total	106	3	53	17	6	7	6	14

factor could be determined. Mitral regurgitation and stenosis combined occurred in 25 instances. Tonsillar infection was responsible for 9. Acute articular rheumatism for 7. Various other infections for 3. In 3 more instances the only history of a preceding infection was an attack of influenza, and in the remaining 3, no etiological factor could be discovered. Uncomplicated aortic regurgitation was observed 6 times. Tonsillitis was responsible for 2 of these cases; acute articular rheumatism for 1; and in the remaining 3 the tonsils were not abnormal, and there was no history suggesting the cause of the infection. Aortic regurgitation, associated with aortic stenosis, was recorded in 4 individuals. Two of these cases had been subject to recurring attacks of tonsillitis. One had had influenza. The fourth case had had some other acute infection. No Wasser-

manns could be done on these aortic cases. A definite presystolic thrill was palpable in 5 of the cases of uncomplicated mitral stenosis. A presystolic thrill was present in 10 cases of double mitral disease. A mitral systolic murmur was associated with 6 of the 10 cases with aortic lesions, and in 1 case of aortic regurgitation a so-called Flint murmur was demonstrable.

It should be emphasized that the diagnosis of mitral regurgitation was never based upon the presence of a murmur alone. The existence of several or all of the following criteria, in addition to the systolic apical murmur, was required before this diagnosis was recognized. These criteria were (1) displacement of the apex beat down and to the left; (2) demonstrable enlargement of the heart; (3) accentuation of the pulmonic second sound; (4) the transmission of the apical systolic murmur to the left axilla or to the angle of the scapula, and (5) a history of tonsillitis, rheumatism, chorea or any combination of these.

Lewis Conner has maintained that if the above-noted criteria are rigidly adhered to, mitral insufficiency will take its place among the less-frequent forms of valvular disease, and Thomas Lewis, of England, is of much the same opinion. From the analysis of this limited material, it would seem that in spite of rigidly adhering to these criteria, mitral regurgitation in women is still the most common single endocardial lesion, since it was noted about 2½ times more frequently than the next most common endocardial involvement. Nevertheless, it is by no means the chief cause of systolic murmurs heard at the apex. It cannot be too strongly emphasized that a systolic murmur audible at the apex, without some other concomitant sign, is not sufficient ground for the diagnosis of mitral insufficiency. In spite of our careful efforts to restrict this diagnosis whenever possible in this series, simple mitral insufficiency constituted 59 per cent. of all cases of endocarditis observed, and 23.8 per cent. of the entire group of 265 cardiovascular conditions.

The diagnosis of mitral stenosis was made only when the classic physical signs were present. Although it is undeniably true that this lesion may be recognized at times by the quality of the first sound alone, such a practice has proved to be too uncertain for general application, and in the present series the examiners were allowed to make this diagnosis only when the unequivocal physical signs existed,

that is, when the rumbling, presystolic or diastolic murmur, heard at or about the apex, was associated with some transverse enlargement of the heart, a tapping apex beat, ringing first sound, and an accentuated pulmonic second sound. In the majority of instances, the well-defined presystolic thrill is confirmatory evidence, but the diagnosis can be made with reasonable assurance without the presence of this valuable physical sign.

The diagnosis of aortic insufficiency, with or without aortic stenosis, offered little difficulty in our present series. The forcible heaving apex beat, displaced well down and to the left, the enormous hypertrophy of the heart, the characteristic vessel signs, the character and wide transmission of the murmur usually made this lesion so obtrusive as to render its recognition comparatively easy. It should be remembered, however, that the diastolic murmur of aortic insufficiency is frequently heard better at the junction of the third left costal cartilage with the sternum, that is over the anatomical position of the aortic valve, then in the so-called aortic area in the second interspace to the right of the sternum. The infrequency of aortic lesions in young men has been emphasized by the Cardiovascular Board of the Army. Our experience in young women is similar. Less than 10 per cent. of our cases of true endocarditis exhibited this lesion. The infrequency of aortic disease in young men and women is probably due to the fact that syphilis of the cardiovascular system does not manifest itself before the 35th or 40th year of life. Sixty per cent. of our aortic cases were associated with relative mitral insufficiency.

The relationship of previous infections, both focal and general, to cardiovascular conditions, in our series of 265 cases, is perhaps worthy of some inquiry. In 72 of the cases, no history of any infection could be elicited, and no evidence of any local infection could be discovered. Recurring attacks of tonsillitis, or badly infected tonsils, occurred in 78. A definite history of acute articular rheumatism was obtained in 25; 15 individuals gave a history of both tonsillitis and rheumatism. Chorea was noted in only 3 instances. Influenza during the epidemic of 1918-1919 had attacked 45. Various other infections, such as typhoid fever, occurred in 16, pneumonia in 14, scarlet fever in 13, diphtheria in 10, pulmonary tuberculosis in 2. One had had smallpox. A history of recurring colds was obtained in 14. Out of 238 instances of previous infection of some kind, 45

were instances in which more than one previous infection had occurred. In 139 applicants or over one-half the cases, dental caries was sufficiently marked as to be obvious on inspection. In view of our present conception of the importance of focal infection, this frequency of dental caries is significant from a general medical as well as from a cardiovascular viewpoint. In 75 per cent. of the cases of chronic endocarditis, a definite previous history of chorea, tonsillitis or rheumatism alone or in association was obtainable. Tonsillitis, or large cryptic infected tonsils, was three times as common as any other single etiological factor in cases of chronic endocarditis. About one third of the entire series of 265 cases had had tonsillitis or were suffering from tonsillar infections; 55.6 per cent. of all the cases of endocarditis had some sort of tonsillar infection. Acute articular rheumatism was the etiological factor in about 10 per cent. of the entire series but 21.6 per cent. of the cases of true endocarditis gave a history of having had rheumatic fever. From a chronological point of view it is not surprising that epidemic influenza was a common infection in this group of cases. It is doubtful, however, whether it plays a rôle of any significance in the production of endocarditis although it seemed to be a definite factor in the group of cases to be discussed later, that have been classed as toxic or infectious myocarditis. Chorea was noticeable for the infrequency with which it occurred. It is more than probable, however, that data in regard to this infection are inaccurate, since it is a disease common in early girlhood and many of the applicants obviously were not well informed as to their early medical histories.

An effort has been made to tabulate the incidence of the various cardiac murmurs as heard in this series of 265 cases. Mitral systolic murmurs occurred 181 times; mitral diastolic murmurs, 8 times; mitral systolic and diastolic combined, 25 times. Systolic murmurs occurred at the base 45 times. Of the murmurs heard at the base an aortic systolic murmur alone occurred 12 times; an aortic systolic associated with a diastolic, 4 times; aortic systolic associated with a mitral systolic, 19 times; and a pulmonic systolic murmur alone, 10 times. Aortic diastolic murmurs alone occurred 6 times. There were 4 instances of cardiorespiratory murmurs, and one instance of a pericardial friction rub.

Of the 181 times that a mitral systolic murmur was heard, in

63 instances it was due to mitral regurgitation, and in 31 instances it was due to mitral regurgitation in association with other chronic valvular lesions, that is there were 94 instances of mitral systolic murmurs due to true endocarditis, leaving 87 instances in which mitral systolic murmurs could not be ascribed to true endocardial lesions. This again emphasizes what has already been said in connection with the danger of making the diagnosis of mitral insufficiency on the presence of a systolic apical murmur alone.

There were 106 instances in which the murmurs heard could be attributed to organic disease of the heart. If we take the 87 murmurs heard at the apex that were not due to any valvular lesion and add the 12 aortic systolic murmurs that occurred alone, and the 10 systolic murmurs that were heard at the pulmonary area, there were 109 instances of cardiac murmurs which could not be ascribed to true endocardial lesions which fall into the class of so-called functional murmurs, and which were the result probably of relative insufficiency of the valves, myocardial degenerative changes or as was frequently the case, some alteration in the quality of the blood itself. It seems fair to conclude that at least 50 per cent. of all the murmurs heard were not due to endocarditis, and of these so-called functional and non-endocardial murmurs, those heard at the apex were four times as common as those heard at the base. If one may assume that the murmurs heard in the 132 applicants that were accepted were functional, then this 132 probably functional murmurs added to the 109 non-endocardial murmurs above referred to, gives a total of 241 instances out of a total number of 7489 applicants examined, in whom murmurs were heard that were not due to chronic endocarditis. In short, in this group of 7489 women, 3.2 per cent. exhibited so-called functional murmurs. It is freely admitted that the whole question of functional cardiac murmurs is imperfectly understood, and any attempt to definitely classify murmurs in this group brings one on dangerous ground. The above figures are, of course, not conclusive. Nevertheless, they are sufficiently suggestive to emphasize the great frequency with which murmurs occur that are *not* the result of chronic valvular heart disease. This statement, however, applies only to systolic murmurs. Although only 63 of the 181 mitral systolic murmurs that were heard, or 34.2 per cent. could be said to be due to mitral insufficiency, 100 per cent. of the diastolic mitral murmurs,

whether they occurred alone or in conjunction with other adventitious sounds, were undoubtedly organic. The same rule applies to murmurs heard at the aortic area, or heard at the base. Although in young people an uncomplicated systolic murmur heard at the aortic or pulmonary area may often with justice be regarded as a so-called functional murmur, there is no instance in this series in which a diastolic murmur heard at the base, whether heard alone or in conjunction with a systolic murmur, could be regarded as anything but of true

TABLE III

The Relationship of Thyroid Enlargement in 265 Cases.

The thyroid was enlarged in 156 instances, 58.8 per cent. In 105 it was recorded as palpable. In 51 it was recorded as definitely enlarged. An enlarged thyroid was associated with a cardiac murmur 115 times.

The frequency and position of these murmurs are indicated below.

Mitral systolic	78 times
Mitral diastolic	4 times
Mitral systolic and diastolic	13 times
Aortic systolic	10 times
Aortic diastolic	6 times
Pulmonary systolic	4 times
Total	115

Of the 156 instances of thyroid enlargement, definite evidences of hyperthyroidism occurred in 70 (26.4 per cent.) cases. These 70 cases showed:

Exophthalmos	6 times	
Hypertrophied heart	17 "	
Tachycardia	63 "	
Tremor	53 "	
Vasomotor phenomena	20 "	
Definite mouth infection	20 "	48, over one-half
Tonsillar infection	13 "	
Both mouth and tonsil infection	15 "	

endocardial origin. It may be stated almost dogmatically, that all diastolic murmurs, whether they are heard at the aortic area or at the mitral area, must be regarded as organic in origin. This dictum is in accord with the findings emphasized by the Cardiovascular Board.

Among the most interesting findings in our series was the relationship of thyroid enlargement to cardiovascular disturbances in young women (Table III). The thyroid was enlarged in 156 instances, or 58.8 per cent. In 105 it was recorded as merely palpable. In

51 it was recorded as definitely enlarged. An enlarged thyroid was associated with a cardiac murmur in 115 instances. The frequency, the position and the time of these murmurs were as follows: Mitral systolic, 78 times; mitral diastolic, 4 times; mitral systolic and diastolic, 13 times; aortic systolic, 10 times; aortic diastolic, 6 times and pulmonic systolic, 4 times.

Of the 156 instances of thyroid enlargement, definite evidences of hyperthyroidism occurred in 70, or 26.4 per cent., of the cases. These 70 cases exhibited the following symptoms: Exophthalmos, 6 times; hypertrophied heart, 17 times; tachycardia, 63 times; tremor, 53 times; vasomotor phenomena, 20 times; definite mouth infection, 20 times; tonsillar infection, 13 times; associated mouth and tonsil infection, 15 times.

The frequency of enlarged thyroid in this group of women is striking, occurring as it did in 58.8 per cent. of cases. In this respect, as was to be expected, the findings in a series of young women differ materially from those in men. In over 25 per cent. of our series, the enlargement of the thyroid was associated with evidences of thyroid toxemia. Compare this with the findings recorded by C. Smith, who found in 500 carefully studied rejections for military service because of cardiac disease, only 25, or 5 per cent., cases of thyro-toxicosis.

It is also interesting to note that in 48, or over one-half of the toxic cases of enlarged thyroid in this series, infection about the mouth or throat had possible etiological significance.

In the material under consideration, there were two groups of individuals that are difficult to classify, and yet which are of distinct importance by reason of the frequency with which individuals of this type are encountered. One group resembles closely the cases so frequently observed in the army and described variously as "D. A. H.," effort syndrome, or neurocirculatory asthenia. The symptoms in this group of young women were much less outspoken than those observed in the army. The individuals in this class were thin, pale and usually poorly developed. A tremor was frequently present. There was a tendency for the hands to sweat and become cold and blue. Their vasomotor tone was distinctly poor. The thyroid gland was frequently somewhat enlarged. In all instances, a certain degree of tachycardia existed. The pulse rose rapidly on slight exertion,

and after exercise, even when the individual was put at rest, maintained for an undue length of time its accelerated rate. Variable murmurs were not uncommon. They were heard usually at the base or were cardiorespiratory in character. These cases of so-called effort syndrome were certainly less frequently encountered among these young women from civil life than was the case among recruits in the army. None of the cases observed in this series was anything like as severe as were many of those seen among soldiers. A more pleasant environment, lack of physical overstrain and better living conditions, probably account for this difference in the severity of the symptoms. It is more than likely that these mild incipient cases of neurocirculatory asthenia observed among these young women, would have been more severe and many more cases would have developed, if these applicants had suddenly been transported to an uncongenial environment and subjected to unaccustomed physical overstrain, as were the men of the draft. However, it is evident that this syndrome, neurocirculatory asthenia, does exist in civil life, that it is by no means peculiar to soldiers, that it occurs in women as well as in men, and is probably more frequent in its incipient form than has heretofore been believed.

The second, and larger, group of 55 individuals which have been classified as infectious, or toxic myocardial degeneration, might possibly be regarded also as cases of neurocirculatory asthenia. They exhibit, however, certain differences, and their symptoms are probably due not so much to disturbed vasomotor tone and an unstable sympathetic nervous system, as to actual, though probably temporary, myocardial degeneration. The symptoms which these cases showed were tachycardia, distinct pallor of the skin and visible mucous membranes, frequent cardiac irregularity and some had variable apical systolic murmurs, usually more marked on exercise. All had low blood-pressures and noticeably poor heart sounds and a feeble compressible pulse. In every instance either the teeth and tonsils were badly infected, or they gave a history of a recent acute infection, such as scarlet fever or influenza, or physical examination revealed the presence of pulmonary tuberculosis, either as an active lesion or as a fibroid one. If the two groups are taken together, 85 out of the total series of 265 cases exhibited definite evidences of circulatory weakness or instability, so marked that they were not fit for employment, and yet no true valvular lesion could be regarded

as responsible for the condition. The fault lay either with a poor heart muscle or some fundamental disturbance of their vasomotor mechanism.

The appearance of definite cardiac hypertrophy and myocardial degeneration, secondary to some form of chronic nephritis, and the one instance of cardiac disturbance, the result of chronic pericarditis, were too few to be of value and exhibited nothing of unusual interest.

Some comment should be made upon the frequency with which irregular heart action was observed in this group of 265 applicants. Definite arrhythmias were noted 36 times. Sinus arrhythmia occurred 19 times, extrasystoles, 16 times; and there was one instance of auricular fibrillation. Seventeen of the cases of sinus arrhythmia occurred in individuals that were suffering either from neurocirculatory asthenia, hyperthyroidism, or came in the group that has been classified as degenerative myocarditis. On the other hand, 10 of the cases that showed extrasystoles were due to definite mitral endocarditis. Auricular fibrillation occurred in 1 applicant who was suffering from mitral regurgitation with beginning decompensation.

The data in regard to arrhythmia are unsatisfactory. Without the use of graphic methods, the type of arrhythmia can at best be only imperfectly determined. The infrequency of any serious form of arrhythmia is rather striking. Sinus arrhythmia can hardly be regarded as a pathological type of irregularity, and if this form is excluded, irregularities of possible serious import occurred in only 7 per cent. of the cases.

The results of these observations on a group of presumably healthy young women, representing a fair average type of the employees found in the business offices of a great city, may briefly be summarized as follows:

1. Out of 7489 women applicants, aged between 16 and 35 years, a little over 5 per cent. showed some departure from what is generally regarded as a normal circulatory apparatus.

2. Of those found physically unfit for employment, 30 per cent. were rejected because of some cardiovascular defect.

3. Chronic endocarditis was observed in 40 per cent. of these rejected cases. The majority, therefore, suffered from other types of circulatory disturbance.

4. Mitral regurgitation uncomplicated, was 2½ times as frequent as any other variety of endocarditis and constituted 59 per cent. of all the cases of true endocarditis encountered. This would indicate that even when the same criteria are used for diagnosis, this lesion is somewhat more frequent in a group of young

women than in the men of similar age studied by the Cardiovascular Board of the Army.

5. Aortic regurgitation was of uncommon occurrence in this group of young women. A finding similar to that observed among larger groups of young men.

6. In the cases of endocarditis, tonsillitis was three times as common as any other etiological factor.

7. Over one-half of the systolic murmurs heard either at the base or at the apex, could not be regarded as endocardial, and might be classed as so-called "functional" murmurs. On the other hand, none of the diastolic murmurs heard either at the apex or the base could be regarded as due to anything but true endocarditis.

8. Cardiovascular symptoms, due to thyro-toxicosis, were present in 26.4 per cent. of these young women. Thyroid enlargement associated with toxic symptoms, therefore, was apparently five times as common in these young women as it was in rejected recruits. Over 50 per cent. of this group of rejected women applicants had some form of thyroid enlargement.

9. Effort syndrome is not by any means limited to soldiers, but in a mild form also occurs among young women in civil life.

Pædiatrics

EDITED BY JOHN FOOTE, M.D.
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THE OCCULT DISEASE OF CHILDHOOD (PYELITIS)*†

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We will begin to-day's lecture with case histories which will illustrate the features of the disease without any intimation at first as to the diagnosis.

The patients whose histories are to be given were seen recently in the Medical Service of the Children's Hospital, Philadelphia, and all of them were suffering from the same disease. This will demonstrate very well the protean characteristics of the symptomatology and the reason why the correct diagnosis often is missed at first.

Case I.—Male, 5 months old. On the day before admission he had had a slight convulsion and was feverish and restless. On the day of admission another convulsion occurred after which, the mother stated, the right arm and leg appeared to be weak. He vomited once and the bowels moved several times. Examination on admission showed slight stupor with rigidity of the neck, but no definite evidence of hemiplegia. The spinal fluid was under slightly increased pressure, but otherwise was normal, with 4 cells per cm. The leucocytic count was 19,600. The temperature ranged from 100° to 103 3/5° F. on the first day and continued an irregular course, tending to a lower range, for two weeks. He left the hospital, greatly improved, four weeks after admission.

Case II.—Girl, 3½ years old. Two days before admission she became feverish, drowsy and complained of pain in the stomach. There

* Delivered before the Tri-state District Medical Association, Milwaukee, Wisconsin, November 15, 1921.

† From the Medical Service of the Children's Hospital, Philadelphia.

was no vomiting and the bowels were constipated. On admission, physical examination was negative. She ran an irregular temperature for the first five days, varying from 100° to 106 2/5° F. After ten days of normal temperature, there was a recrudescence for three days, reaching 102° F. The leucocytic count was 28,400. There were no noteworthy symptoms while she was in the hospital and she left on the 27th day, perfectly well.

Case III.—Girl, 8 years old. For several months she has been subject to attacks of abdominal pain, diarrhœa, vomiting and disturbed sleep. Apart from bad teeth, examination on admission was negative. The leucocytic count was 11,000. The temperature never exceeded 100 3/5° F. After an uneventful course of two weeks she left the hospital greatly improved.

Case IV.—Girl, 6 years old, who gave a history of frequent "colds" and eneuresis. Two days before admission she suddenly developed fever, complained of general aching and was unable to stand on account of pain in the hips and feet. There was complete anorexia, with occasional vomiting, and constipation. The temperature was 103° F. on admission, but fell to normal on the third day. The leucocytic count was 19,200. Physical examination was negative so far as a cause for fever was concerned. With the cessation of fever, all subjective symptoms disappeared and she was taken from the hospital in eight days, greatly improved.

Case V.—Boy, 5½ years old. One week before admission he became feverish, complained of chilliness and pain in the right knee and ankle and, later, in the abdomen. Anorexia, occasional vomiting and thirst were the only other symptoms. Examination was negative as to a cause for the pain and fever, which ran an irregular course for eight days ranging between 98° to 99° and 101° to 103° F. After 26 days he left the hospital, practically well.

Case VI.—Girl, 10 months old. Two weeks before admission she began to vomit after meals, and later had diarrhœa. On admission the temperature was 99° F. and ranged between 97° and 99 2/5° with occasional rises to 100 3/5° or less. Physical examination was negative except for marked dehydration. Apathy, extreme anorexia, occasional vomiting and slight intestinal indigestion have been the only noteworthy symptoms. The blood-count showed 3,250,000 erythrocytes, 29,300 leucocytes and 57 per cent. hemoglobin (Sahli).

In addition to iron citrate by hypodermic injection she has received one transfusion of blood. She is still in the hospital after seven weeks, but probably will recover.

Case VII.—Girl, 7 years old. On the day of admission she became feverish and complained of left-sided abdominal pain and nausea. During the night she vomited several times and passed urine frequently. On admission the temperature was 104 2/5° F. and ranged between that and 100° F. for six days. The abdomen was tender, with slight rigidity on the left side. On the next day these signs had disappeared and she left the hospital in 18 days greatly improved.

Case VIII.—Girl, 3 years old. Four weeks before admission she had suddenly developed fever, vomited several times, sweat profusely and had a convulsion. Anorexia was complete and she complained of thirst, pain in the right lumbar region and severe dysuria. The convulsion was not repeated, but the other symptoms persisted, in a modified form, until admission. Examination showed slight tenderness in the abdomen and in both lumbar regions, which gradually disappeared in four or five days. The temperature was normal except for several sudden rises to 101° to 104° lasting for two or three days. The leucocytic count was 10,200. After five weeks she left the hospital, improved but not cured.

COMMENT

It will be noted that fever was the only symptom which was common to all of these cases and that even the fever was a variable factor. Vomiting occurred in seven of the eight cases. In other respects the symptoms varied from those of a meningitis to those of a simple attack of "functional" diarrhœa. In every case physical examination failed to reveal the cause of the attack and in every instance the diagnosis depended solely upon the examination of the urine. This showed consistently an acid reaction, more or less albumin and a moderate or excessive number of leucocytes. Upon these findings, in the absence of other cause, was based the diagnosis of pyelitis. In only two of the eight cases had there been any symptomatic evidence of disturbance in the urinary tract.

During the past two decades pyelitis has come to be recognized as one of the usual diseases of childhood. Richard Smith estimates

its incidence at about 1 per cent. of all children coming under treatment. In a recent survey of 734 febrile cases treated in the medical wards of the Children's Hospital, Philadelphia, 12 or 1.6 per cent. had pyelitis.

You will find no mention in the older pædiatric literature of the type of pyelitis illustrated by these cases. Even in the four volumn "Encyclopedia of the Diseases of Children" published in 1890, the only condition considered is that of pyonephrosis which is described as hydronephrosis with pyelitis superadded, due primarily to mechanical obstruction to the outflow of urine. The most important cause, apart from congenital defects, seems to have been renal or cystic calculi. It appears therefor that only severe forms of pyelitis were recognized. From what is known of the etiology of pyelitis, there is no reason to believe that it was any less common then than at present. On the contrary it probably was more common, owing to the greater incidence in those days of diarrhœal diseases. It seems probable that primary forms masqueraded under the guise of "difficulties in teething" or "gastric fever"—to use some of the favorite diagnoses of the past. These primary forms of pyelitis, as diagnosed to-day, certainly do not require any mechanical urinary obstruction for their causation.

In the same volume we find the statement by William Hunt that from 50 to 60 per cent. of cases of stone in the bladder occurred in children under 16 years of age, while renal calculi, according to Henry Morris, were found "very commonly" in the children of the poor up to the age of 15. The latter fact was ascribed, among other things, to absence of milk in the diet and to the use of indigestible articles of food. That both renal and vesicle calculi in children are much less common of late years will be attested by surgeons, while "pyonephrosis" is a rare disease. This suggests the possibility that the frequency of lithiasis in the past was dependent in part upon the frequency of pyelitis, which, unrecognized and not treated, furnished the infective nidus without which calculi do not form.

ETIOLOGY

We may consider pyelitis as occurring in two forms: (1) The so-called primary form in which we are chiefly interested and (2) the secondary form which occurs as a complication of other diseases. In

both forms the exciting cause is bacterial, the B. coli, streptococcus, staphylococcus, pneumococcus, B. lactis aerogenes, etc.

There are three chief theories as to the manner in which the bacteria reach the kidney—(1) ascending infection through the ureter, (2) lymphogenous transmission directly from the bowel and (3) hematogenous infection. To these may be added transmission through the lymphatics of the pelvis or the periureteral lymphatics.

The chief argument in favor of ascending infection through the ureter is the preponderance of cases among girls, almost three to one, and the ease with which the urethral orifice in girls is contaminated with intestinal bacteria.

As Richard Smith points out, however, this contamination involves other structures than the urethra. He found positive cultures from the vagina in each of 40 babies and young children, beginning from the 6th hour to the 6th day of life—the majority occurring as early as the 18th hour. The lymphatics which drain the vaginal and pelvic organs have a free anastomosis with those of the kidney, and both, of course, empty into the blood stream through the thoracic duct.

Under experimental conditions Helmholz and others have been able to infect the pelvis of the kidney by injecting B. coli into the bladder. It was clear, however that the infection often reached the kidney by way of the periureteral lymphatics and absolute proof was lacking of the entrance of the bacteria into the pelvis solely through the lumen of the ureter. That infection by either route occurs under normal conditions when comparatively few bacteria gain access to the bladder in human beings seems most unlikely. This is increased by the fact that in his experimental animals Helmholz always found acute inflammatory reaction in the wall of the bladder after the intracystic injections. If pyelitis in children is caused by organisms that gain entrance through the urethra they would be expected to set up first a cystitis, whereas cystitis usually is only a late complication of severe cases.

Helmholz's studies on the bacterial content of the urethra in girls showed that the B. coli is not a normal inhabitant over two years of age. Under that age he found the bacillus quite frequently, especially during the course of extra-urinary infections. He ascribed this to the greater difficulty in cleansing and disinfecting the urethral orifice in girl babies. It is also very difficult to insert the catheter

cleanly into the orifice without touching the outer edge. By drawing the urine separately into a first and second portion, Helmholz was able to determine that the infection was present in the orifice and the urethra and not in the bladder.

Since Frank drew attention to the lymphatic connection which exists between the colon and the right kidney it seems quite possible for a pyelitis or renal infection to result from direct transmission from the bowel. Its relative importance cannot be stated, but at least it fails to explain the discrepancy in sex incidence.

Hematogenous infection can occur in any organ or structure which is well supplied with blood. Pathogenic organisms may pass through an organ without setting up any recognizable disease, as occurs when typhoid bacilli pass through the kidneys. On the other hand, various organisms which are brought to the kidney by the blood stream may set up focal disease in the parenchyma or cortex or may pass through and cause infection below the secreting structures—primarily in the pelvis. For example, Helmholz injected the ear vein in a series of 66 rabbits with different strains of B. coli. In 26 of the rabbits, various focal lesions were produced, often multiple. In eleven cases the kidney was involved, chiefly in the form of focal abscesses, while in only two was the pelvis alone effected. Other lesions were produced twenty-six times in various organs, chiefly the gall-bladder and cæcum, as compared with eleven renal infections. When pneumococci were combined with B. coli, and seven rabbits injected, three showed pyelitis alone, one a cortical renal abscess and two had renal hemorrhage, while lesions of other organs occurred only four times. These results open up the complicated question of symbiosis, but are interesting as proving that renal lesions can be produced by a purely hematogenous route. The fact that so many multiple lesions and extra-renal lesions resulted tends to throw some doubt upon hematogenous infection as the principal cause of human pyelitis although Rosenow has shown that certain bacteria apparently possess definite selective action in their localization. For example streptococci cultured from renal lesions tend to produce a higher percentage of renal infections in experimental animals than do those from other sources. In this light, the special type of the infecting organism may be the chief determining factor in the pathogenesis.

In all of Helmholz's cases of experimental pyelitis, the chief

inflammatory reaction occurred in the papillæ, whereas the pyelitis which followed intracystic injection involved chiefly the parietal portions. Helmholz believes that, so far, this constitutes the only histological distinction between hematogenous and ascending infections.

The whole subject of the mode of infection is still sub judice. Whatever the final decision may be, in part it probably will involve the sexual anatomy since the preponderance of pyelitis among girls is too great to be explained on any other basis.

PATHOLOGY

In a recent paper before the American Pædiatric Society Helmholz emphasized the impossibility of determining, intra-vitam, the exact site of infection of the urinary tract. In simple uncomplicated cases of pyelitis such as we are illustrating, it has been believed that the lesions at first involved only the structures of the pelvis, but in the pathological study of certain specimens from fatal cases of clinical pyelitis Helmholz was unable to find any histological change in the pelvis itself. This apparently lines up the whole question of pathology with that of the mode of infection, and throws greater stress upon the importance of bacteriologic studies in fatal cases.

The findings of so-called "pyelitis," such as pus cells and positive cultures, therefore indicate merely the presence of a urinary infection. Only with cystoscopic examination, urethral catheterization and X-ray studies can we hope for greater accuracy in determining the exact size of the disease. Fortunately, however, the average case can be diagnosed with reasonable accuracy by comparatively simple methods and we are justified in retaining the clinical designation "pyelitis," if we always bear in mind the possibility of the existence of the other lesions.

SYMPTOMATOLOGY

The cases which have been detailed illustrate practically all of the important symptoms of simple pyelitis. Without examination of the urine accurate diagnosis is impossible. It should be emphasized, however, that whereas pyelitis may be primary without any antecedent disease, intestinal disorders very frequently precede the attack. Adherents of the theory of direct infection from the bowel emphasize this but, as stated, it fails to explain the sex incidence.

It seems rather to point to infection from vaginal or urethral contamination. Not rarely an apparent primary attack is but a recrudescence of a chronic infection. There is also reason to believe that reinfection occurs. None of the usual organisms involved confers any lasting immunity, and the original avenues of infection certainly may be open.

The secondary form of pyelitis occurs occasionally in the course of one of the other infectious diseases such as typhoid fever or pneumonia. In any recrudescence or increase of fever in such diseases the urine should be reëxamined.

According to the modern theory of hematogenous infections, we may conceive that diseased tonsils, teeth, sinuses or other localized abscesses can furnish the infective material and quite recently Bumpus and Meisser succeeded in producing renal lesions in 76 per cent. of 82 rabbits which had been injected with streptococci recovered from teeth, tonsils, urine and blood of seven adult patients suffering from pyelitis. Again this seems to point to a selective localization on the part of these streptococci. Since the infective focus in five of the seven patients was in the alveolar processes, the applicability of the results to children is open to question, and the increasing number of instances where the tonsils have been enucleated will enable us soon to judge of the importance of the tonsils. Compared with intestinal disturbance and its consequent local contamination, hematogenous infection from such sources, however, must play an unimportant rôle, and again, it fails to explain the preponderance of cases among girls.

DIAGNOSIS

The diagnosis of pyelitis in a child can be made tentatively in less time than is required to describe it. A drop of urine on a slide without a cover glass is examined with the high power "D" objective. If the number of leucocytes exceeds 10 per field there is great probability of pyelitis being present. Other specimens must be examined before a final diagnosis is made. In true pyelitis the number of leucocytes will increase.

Certain precautions must be taken—(1) the urine must have been passed within 2 or 3 hours unless it has been kept at a low temperature—45° or less. In any event, not more than 10 to 12 hours should

have elapsed. (2) The urinary meatus in both sexes, and the vaginal orifice in girls, must be free from any signs of inflammation or discharge. (3) The urine must be thoroughly mixed before putting the drop on the slide. For this reason it is better to use uncentrifugated or unsedimented urine.

Under conditions one or two the urine will almost invariably be acid, if no alkali has been given to the child, and usually contains at least a trace of albumin. Small epithelial cells may or may not be abundant. Occasionally we find a few casts, but their constant presence or a large number indicates that we may be dealing with an infection of the kidney itself. An alkaline urine, freshly passed, containing triple phosphates and large epithelial cells suggests a pyelocystitis, since cystitis alone is rare, apart from local causes such as traumatism, vesical growth, etc.

If there is any doubt as to the presence of local irritation which might vitiate the leucocytic count and if, at the same time, the diagnosis is not clear, the child should be catheterized with the precautions to be detailed later, and a bacteriological study should be made. If, on the other hand, the number of leucocytes is below 10 per field, the count should be repeated daily for several days, as a single specimen may, for various reasons, give inconclusive results.

If the count continues to be suspicious, from 5 to 10 cells, and the diagnosis still be in doubt, the child should be catheterized for a bacteriological study of the urine.

In a true case of pyelitis the early samples of urine may show comparatively few cells in a relatively clear urine, but in a short time the cells show a marked increase and the urine will become more or less cloudy. Sooner or later, cultures will prove to be positive, but in general practice a culture usually is not necessary for diagnosis and successful treatment. In doubtful cases cultures are essential.

At the Children's Hospital we secure a sample of urine from little girls as follows:[1] Through a piece of adhesive plaster approximately 3 inches square two median slits are made at right angles just large enough to admit the flange of an ordinary 2 or 3-ounce glass bottle, passing the latter through from the "back" of the plaster

[1] This method is not original, but we regret that we are unable to recall the name of the originator.

to the "adhesive" side. Each corner of the plaster is slit up 1 1/2 to 2 inches to provide for a tight apposition. The plaster can be made to fit the bottle tightly by wrapping an extra piece around the neck and is then applied over the vulva so that the mouth of the bottle lies just at the urinary meatus. By carefully fitting the lower end of the plaster in front of the anus it is possible to avoid fecal contamination even in the presence of diarrhœa. The bottle can be held loosely in place by the diaper. The only contraindication to the method is dermatitis or severe irritation of the vulvæ and perineum.

CATHETERIZATION

Two objections are inherent to catheterization in these cases, one of introducing new or mixed infection and the other of obtaining positive cultures from accidental contamination and thus causing error in diagnosis. It is often stated that the introduction of a few bacteria on the catheter is never followed by infection. Although there is much evidence in favor of this contention, in view of the undoubted presence of various pathogenic bacteria from the intestine and the lowered resistance of the child, it certainly seems more rational to take every precaution against infection.

Many types of technique have been employed, but none is altogether satisfactory. The important points are to keep the labia separated and to attempt to cleanse only the vestibule and urethral orifice without touching anything else. For cleansing, tincture of green soap and distilled water followed by bichloride of mercury solution (1 to 1000) and distilled water, may be used, or a 2 per cent. solution of lysol may be followed by distilled water. The solutions and water may be applied by douching freely, using a medicine dropper or small syringe. Great care must be taken to insert the catheter cleanly without contact with any other part or object. The urine should be collected in two portions and only the last used for culture. Before withdrawing the catheter the bladder should be washed out with 5 per cent. boracic solution.

The acute case of pyelitis under appropriate treatment usually makes a prompt symptomatic recovery, but eradication of the infection often is extremely difficult. When fever and constitutional symptoms persist beyond three or four weeks, in spite of treatment, there is probability that the renal structure is involved. Fatalities

are due usually to severe anæmia and parenchymatous degeneration of various organs due to prolonged sepsis, to pyæmia with secondary abscesses, pneumonia, etc., or to "surgical kidney." Very rarely does the disease prove to be tuberculous or malignant.

There is a large percentage of cases that, in spite of treatment, continues to show pus cells in the urine. In some of these the anæmia, anorexia, lack of energy and slight or occasional fever suggest a variety of causes and such cases are often incorrectly diagnosed. In others there may be little apparent effect upon the child's health. How many of both of these types finally recover and how many drift into more severe and fatal forms of urinary disease or die of anæmia, sepsis and exhaustion, is problematical. Some authorities believe that some of the cases of pyelitis or pyelonephritis of adult life had their inception in these attacks of childhood.

TREATMENT

Apart from the removal of possible foci of infection the greatest importance in the treatment of pyelitis attaches to securing free drainage by supplying large amounts of water. When this is refused or vomited, it may be given by the nasal rather than by the stomach tube, as the former is less apt to cause gagging. From 500 to 750 c. c. (16 to 24 ounces) of water should be given to infants daily in addition to other liquids, with larger amounts to older children. By determining the specific gravity of the urine we can make an estimate of the degree of urinary "dilution."

When vomiting is persistent, water should be given by the intraperitoneal method. Case VI in this series has received 40 intraperitoneal injections, without which, it is fair to say, recovery would have been impossible.

The next measure in importance is to secure complete alkalinization of the urine. Citrate of soda is better borne by the stomach than bicarbonate of soda and both can be given safely in larger doses than can the salts of potash. All of these may be used, but enough must be given to keep the urine constantly alkaline. In infancy, 4 grams (60 grains) of sodium citrate a day may be the "basic dose," with 1 to 2 grams (15 to 30 grains) of the bicarbonate or potash salt if needed. The largest single dose should be given at night to carry over the period when acidity is highest and intake lowest.

Usually there will be definite improvement in the fever and toxic symptoms after four or five days of the alkaline treatment. Just how it acts is unknown. While improvement lasts, the alkali can be continued, so long as there are no signs of over alkalinization such as a positive reaction to thymolphthalein (.5 in 100 c. c. alcohol). If no improvement occurs in five days, we may try hexamethylenamin. This must be given in large dose, at least 1 gram (15 grains) in 24 hours for infants of five or six months. Since this drug will not be liberated in alkaline urine, all alkali by mouth must be stopped. Acid sodium phosphate or dilute hydrochloric acid may be used to render the urine acid.

With a free supply of water there seems to be little danger of hematuria, but the treatment should not be continued steadily for more than six or seven days and may be followed by another course of alkali. This alternation may be continued at weekly intervals and often will be completely successful. When the pyuria persists we may try an autogenous vaccine, although too much should not be expected from it. Recently, the injections of silver salts into the pelvis by urethral catheter have given excellent results. For example, Kretschmer and Helmholz report complete cures in nine of eleven cases ranging in age from seven months to 10½ years, using a .5 per cent. solution of nitrate of silver.

In all severe chronic cases the secondary anæmia indicates the use of iron. Probably the best results are obtained by hypodermic injections of iron citrate. Arsenic should not be used. In the worst types blood transfusions are indicated.

The selection of a suitable diet is of definite value. During the stage of alkalinization, the free use of green vegetables and orange juice aids in reducing acidity of the urine and stimulates diuresis. The vegetables may be fed to babies in the form of purées or as vegetable soup. Many green vegetables have the additional advantage of being natural hematinics. The only contraindication to their use is intestinal indigestion or vomiting. If there is difficulty in securing an acid reaction for treatment with hexamethylenamin, vegetables may be stopped and lactic-acid milk, made palatable with sugar or saccharin, may be used as the chief food.

In the mild types, when all treatment fails to clear the urine, a trial should be made of the "fresh air cure." For all the severe

types and for the most stubborn mild types expert urological advice should be sought. The importance of persistence in treatment lies in the potentialities for serious or fatal disease which exist when there is definite infection of the urinary tract.

PREVENTION

In the absence of definite knowledge as to the exact modes of infection, prevention must be somewhat empirical. Cleanliness probably is of greatest importance. During attacks of diarrhœa particular care should be taken to cleanse the vulvæ as promptly as possible after soiling has occurred. For this purpose the child should lie on one side, instead of on the back, and all pressure should be made from before backward. After the gross cleansing, sponging may be done with one per cent. lysol solution on a sterile cotton pledget. The free use of water internally in such cases and in the infectious diseases has other advantages than those usually ascribed to it, since polyuria probably means a lessened chance for urinary infection.

THE STOOLS OF NEW-BORN BREAST-FED INFANTS

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Of no other system of the new-born infant are greater tasks demanded than from the alimentary canal. From an environment of warmth and comfort where it existed with its food offered in a perfectly predigested form it is suddenly deprived of all nourishment and forced to obtain its nutrition from as yet unfunctionating breasts by its feeble sucking efforts. The breasts, empty save for colostrum, rather a laxative agent than a food, offer no nourishment for a period of several days, after which the infant receives an overgenerous supply of food until the mammary function is properly established and the secretion of milk becomes regular.

From the results of frequent physical inspection and the estimation of body weight one gains an idea of the effect of breast feeding. But too often the breast milk is not properly assimilated or absorbed, or its quality may be changed from normal through unsuitable diet or disease, and often too, although an infant may be making a slow gain in weight his food is not properly digested, and it is only by a study of the stools that knowledge may be had as to the end results of gastrointestinal digestion.

One of the normal effects of birth on an infant is to activate the peristaltic action of the muscles of the stomach and intestines. Commonly meconium is passed during or immediately after birth. The failure of a new-born infant to have a bowel movement within twelve hours after birth should be the occasion to investigate the patency of the anus and rectum. This may be done by inserting the gloved little finger, well lubricated, into the anus. If no septum or obstruction exists a passage of meconium should follow the withdrawal of the finger. The finding of an obstruction should lead at once to the appropriate surgical treatment.

The contents of the intestines of the new-born infant represent the accumulated débris and intestinal secretions formed since the fourth month, together with bile, epithelial cells and swallowed am-

nionic fluid and mucus. The presence of bile gives to meconium its brownish-black color. Meconium has no odor, but becomes quickly offensive when moistened with water. The meconium is usually completely evacuated from the intestinal canal within four days after birth and gives place to the normal yellow custard-like stools of the nursing period. Not infrequently meconium may give the chemical reactions for blood pigments, this is probably due to the admixture of maternal blood swallowed during labor. At birth meconium is usually sterile, very soon after birth, however, infection takes place both by mouth and by anus. And Escherich, who first studied the bacteriology of meconium, was able to isolate seventeen varieties of bacteria. The invasion is progressive and reaches its climax on the third day after birth. After which the bacterial flora of the intestines assumes the customary characteristics according to the manner and nature of the feeding.

On the second or third day after birth the stools become somewhat thinner and softer, although they are still brown they are less tenacious and sticky than meconium and are poorer in substance. On the third and fourth days stools appear which like the so-called starvation stools are dark brown in color, poor in substance, small in quantity and thin and greasy. If nursing takes place at the usual time stools occur which are intermediate between the meconium and the stools of the lactation period. These are known as transitional stools and are usually very greasy. These stools often have a distinct sour smell. The stools now become more and more like those of the lactation period. At first this color is still greenish brown or brownish yellow, and finally distinctly yellow or somewhat greenish and showing small yellow fragments of soap. Generally the first symptom which makes the stools recognizable as such is the marked and peculiar sour smell. The yellow color rarely appears before the fifth or sixth day and then only when the supply of milk is plentiful. The normal milk stools of the first period almost always contain mucus and are friable. The normal stools of a healthy breast-fed infant are yellow in color, have a sour smell and an acid reaction.

The stools normally number from three to four, more than this number should be considered as indicating some type of intestinal indigestion. Diarrhœa, however, is often due to such simple causes

as overfeeding and overnursing and to too little water drinking. On the other hand two or even three movements a day do not preclude constipation in the infant if the stools are firmer and drier than normal and the stools expelled with straining and evidences of pain. Some new-born infants have a stool at each nursing time, yet examination may disclose no abnormality in the movement. The yellow color of the normal stool is due to bilirubin, a bile pigment. The green color is due to the oxidation of the bilirubin to biliverdin. This may be due to rapid peristalsis or to an oxidizing ferment from leucocytes which have entered the mucosa by diapedesis. Rarely the green color may be due to the bacillus pyocyaneus or other chromogenic bacteria. The cause of the change from bilirubin to biliverdin is not exactly known, but in the acute intestinal indigestion in infancy this change in color is almost constant.

Green stools, associated with marked frequency, fever and signs of gastrointestinal distress, colic and pain, are perhaps the most frequently seen pathological process in the nursing infant. This set of symptoms may point to intestinal infection, to an overrich mother's milk, or to a susceptibility of the intestinal mucosa. A prompt and thorough cleansing of the intestinal canal by castor oil purgation followed by copious saline irrigations of the large bowel and the administration of large quantities of water, with a reduction in the amount of breast milk by shortening the period of nursing and lengthening the interval between nursings will usually suffice to effect a speedy cure. As a rule medicinal treatment and stimulation are not required. The diet of the nursing mother should be inquired into and modified if necessary. Often it will be found that a markedly low water intake of the nursing mother is the cause of a relatively overenriched milk.

Frequently breast milk high in proteid content from maternal overfeeding will cause constipation in the new-born with curds of undigested casein in the stools. Excess fat in the mother's milk, according to Griffith, may result in three varieties of fat stools; a soapy stool, a fatty stool, and a curdy stool. The curdy fatty stool, well pictured in Figure 4 of the Frontispiece, is described by Griffith as a curdy stool containing numerous large or small curds, acid in reaction, the curds are usually soft white, composed of fat; aside from the curds the stool is greenish, diarrhœal and mucus is always present.

Both fat and proteid in the mother's milk are increased by a diet that is largely of animal food and diminished by one consisting chiefly of vegetables. In cases where the proteids are in too great amount it may be possible to remedy the matter by putting the woman on a vegetable diet and, if necessary, make up the deficiency in fat by giving her cream to drink.

Blood in the stools of the new-born may be the result of blood swallowed during labor, or suckled from bleeding eroded nipples, from obstetric injury to the mouth, anus or vagina, or as a manifestation of hemophilic bleeding in the alimentary canal. In the new-born female infant blood from the not uncommon vaginal bleeding may appear as an admixture in the stools.

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Surgery

CANCER FROM A SURGICAL STANDPOINT

By ARTHUR DEAN BEVAN, M.D.

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I HAVE been very much interested in the program this evening and in the very interesting cases exhibited by Doctor Beck which I think are very illuminating and very encouraging and make one feel that we should never give up in our attack on these cases, because even though some of them may appear very hopeless, there are a few of them that can be saved by the means that are at present at our disposal.

I have been very much interested in Miss Slye's presentation of her work. It has rather shattered some of my preconceived notions and some of the things I have been telling my patients. I think her argument is scientific and sound and rather explodes the idea that has been promulgated by the American Society for the Control of Cancer. Her work is a scientific demonstration that our former position was not well taken. Whether we shall ever come to the time when we will breed men like we breed mice and eliminate cancer in this way is a very open question, and yet there may be some facts shown from scientific research of this kind that may enable us to control the situation and eliminate this great plague as General Gorgas eliminated the plague of yellow fever. At least, it is one of the hopes and one of the possibilities of science.

Doctor Smithies' paper demonstrates there is no medical side to cancer. I think he was put down to discuss the medical aspects of cancer. Cancer is a surgical disease as far as the therapy is concerned. As far as the diagnosis is concerned, it belongs to the entire medical fraternity, and it is one of our heavy duties. I think we should have this conception of cancer, that it is purely a local disease; that it begins with a single cell which for some reason, hereditary or otherwise, changes its characteristics. My own conception is, and

I carry it with me in my clinical work, that for some reason that single cell has been impregnated by some agent, as an ovum becomes impregnated, which changes its characteristics and changes from a normal orderly method of growth into a disorderly, riotous growth which we know as malignant disease. This conception is important because it carries with it the idea that cancer begins at a single point. When it does begin, I think in a practical way we could—if we recognized it very early, and cut out from that individual the block of tissue containing that single riotous cell—cure the patient. All clinical evidence seems to point that way. The possibilities in a practical way are controlled by a number of facts. An individual who has cancer is fortunate if it is situated on the surface and can be easily recognized, and early diagnosis made, and early treatment instituted. In a deep-seated cancer the individual is fortunate if the cancer produces very early symptoms. The cancer at the pylorus that immediately produces obstruction is a favorable case for a permanent cure. A cancer of the larynx that will very early call attention to its existence is the most curable in the majority of instances.

Another point that we must keep in mind in a practical way is that anatomical location is very important. Cases of cancer of the prostate, where you cannot remove a large block of tissue and go wide of the disease, are unfavorable. In fact, the prostate is in contact with the rectum, bladder and ureters, thus rendering prostatic cancer one of the most hopeless positions in the body for carcinoma. The same is true of cancer of the pancreas. Cancer of the breast gives us a very favorable condition because here early recognition of the disease is apparent. Anatomically the condition is such that we can remove a large block of tissue and succeed in curing the patient.

In a practical way, is cancer curable? Of course it is. It is curable by its removal; whether it is removed by the knife, whether it is removed by the cautery, or whether it is removed by some chemical, is a matter of little moment. In a practical way cancer is to be removed by the knife, and in the early case, where we can remove a block of tissue containing all the cancer cells, we can cure the patient. It means that the case must be seen when the cancer is limited to the primary lesion. The moment we get regional involvement, the chances of a cure, even by wide dissection of the draining

lymphatics, become small. I am under the impression that in cancer of the breast, where the disease is limited to the breast, and an operation is done and the breast removed *en bloc,* a cure occurs in from 80 to 90 per cent. of cases. It would be 100 per cent. in the cases where carcinoma is absolutely limited to the block of tissue removed. The moment, however, regional involvement occurs, even with this wide dissection the prognosis is exceedingly unfavorable.

Radium and the X-ray have given us a good deal in the way of value in preventing recurrence. My experience is that in many cases of carcinoma of recurring cancer of the breast a small, definite nodule, the size of a cranberry or hazel-nut, disappears under the X-ray after an operation. When such a nodule develops alongside of the scar, from a few microscopic cancer cells left at the primary operation, it is fair to suppose that the microscopic mass of cells from which this sprang would disappear under the X-ray if it is used immediately.

My friend Schmieden, at Frankfurt, has practically discarded operations entirely in sarcoma. He is handling practically all of his sarcomas with X-ray and radium.

As my time is limited, I simply want to give you this practical thought: Let us handle this whole subject perfectly honestly with ourselves and with the public. There is a danger in handling this subject, as we are doing it now in this way: There are a good many dishonest men in our profession. Witness the fact that there are a great many men who are prescribing to-day a pint of whisky for their patients. I do not believe any reputable scientific man should ever prescribe a pint of whisky for any patient as is being done to-day. The big asset of the profession should be honesty. The three great assets of medical men are honesty, good judgment and scientific training. When you apply these to the cancer problem, it becomes a very important thing to the patient to pick out the honest medical man, the man of judgment, and the man with scientific training. Let me illustrate what I mean by a single reference to the question of tumors of the breast.

I see I think 50 women a year who are advised to have the breast amputated for a tumor or for cancer where no cancer exists. If that is true, we want to be very careful about the cancer propaganda, because it means that a good many medical men are urging operations

in cases of this kind just as a certain number of medical men are prescribing a pint of whisky for a patient. They are dishonest. They are doing it for money. I bring out that point because women are very much disturbed by this whole situation. We are going to present a propaganda very widely through the public that the early recognition of cancer—let us say of the breast—is very important, and, if properly treated, it may be followed by cure, and I believe that is a fact. When we are doing this, however, I should like to urge very strongly this point of view, that we must be sure the woman has a cancer; we must not do an unnecessary operation. We must not unnecessarily disturb people about this whole subject. I want to present that point of view to you. On the other hand, I am firmly convinced in my own mind that with a perfectly honest propaganda to the public, with a perfectly honest attitude of the entire medical profession in the handling of this work, we can be of enormous service and can cure a great many of these patients.

CLINICAL DEMONSTRATION OF APPARENTLY HOPELESS CASES OF CANCER TREATED BY SURGERY AND RADIUM

By EMIL G. BECK, M.D., F.A.C.S.

Surgeon to North Chicago Hospital

The laity has a perfect horror of the word cancer. To them it means certain death. Fortunately this pessimism is on the wane because surgery and radiotherapy have, in the past few years, made such advances that the public as well as the physicians are becoming more hopeful.

The cancer problem is being so vigorously and persistently attacked by educators as well as by the medical profession and laboratory investigators that we should not be at all surprised to have this dreadful disease in check during this generation.

As I am on the program to demonstrate cases, I suppose that I am expected to show that cancer actually *can* be cured. Almost every surgeon has on record some patients whom he considers to be cured of cancer, as they are apparently well 5 years or more after the operation, the time which is usually considered sufficient to be a cure. Such cases are not rare; but I desire to show that even in the most hopeless cases, we are able to save a small percentage.

I shall demonstrate a few cases now from a series of a little more than 100 apparently hopeless cases treated during the past 6 or 7 years. In this group we include only such cases as have either progressed to a stage of inoperability or on which one or more operations had been performed and a recurrence had taken place; in other words all belong to the 100 per cent. mortality group.

These cases were treated upon a principle which I believe gives them the best chance and possibly the only chance for recovery. It consists in the conversion of a deep-seated growth into a superficial one; in other words the diseased portion is excised as radically as is consistent with safety, and the wound left open no matter how large it may be, so that the radio-active substance can be introduced

into the bottom of the cancer bed from which the tumor has been removed.

As I have only 15 minutes for the demonstration of cases, I am unable to enter into details of either the surgical or radiological technique and refer the reader to my previous publications. I simply show these cases as a clinical demonstration and shall bring out some practical points pertaining to the treatment as the photographs appear on the screen.

Case I.—*Sarcoma of the Wrist—Amputation 15 years ago. No recurrence.* This lady is about 40 years old. At the age of 25 she developed a sarcoma of her right wrist. I consulted with Doctor Nicholas Senn and he advised me to amputate the arm below the elbow. I hesitated and removed only one of the metacarpal bones which I had examined by Doctor Herzog who pronounced it sarcoma. From the day the bone was removed the disease progressed so rapidly that I was compelled to resort to the amputation two weeks after the operation. She was then in her sixth month of pregnancy. There were no complications nor any signs of metastases in the lungs. The patient gave birth to a normal child at the end of the period of gestation. She remained well for six years when she developed a small tumor on the back of the neck. The tumor was about the size of a walnut, hard and not well defined. Suspecting that it was a sarcoma I excised the same radically, and left the wound entirely open. I inserted 10 milligrams of radium element for 24 hours without any screening. The wound grew by granulization and and epithelization, and there has been no recurrence to date. The child has always been in perfect health and is now 14 years old. You note that her elbow-joint has assumed the function of the hand; she is able to do her housework and has developed quite a dexterity in the stump, for she is able to make change with the end of the stump, being cashier in the meat market of her husband.

Case II.—*Angio-sarcoma of the Shoulder.*—This man, aged 48, was operated on six years ago for a large tumor of the left shoulder. (Fig. 1.) The tumor involved the entire region of the scapula and deltoid region, and having grown very slowly, I took it for a benign tumor. The operation was difficult because the tumor had no capsule and was diffusely connected wth the underlying muscles and scapula and bled profusely. It had partially destroyed the muscles of the

scapula and firmly adhered to the bone; but the bone did not seem to be involved. Microscopic sections revealed it to be angio-sarcoma. One hundred erythem doses of X-ray with long spark-gap for deep penetration were given subsequent to the operation. There has been no recurrence to date. (Fig. 2.)

Case III.—*Carcinoma of Lip and Neck.—Excision without suturing.* This man is 70 years old; has had a small epithelioma on his lip for many years which began to grow rapidly two years ago. It was treated with radium, but in spite of that it progressed so that it involved the entire left cheek. A radical resection (as you can note from the photographs) of the entire cheek and parts of the upper and lower jawbones were laid bare. (Fig. 3.) No sutures whatever were used to diminish the external wound. Thirty-seven and one-half milligrams of radium were then inserted directly into the borders of the wound (3 needles each 12½ mlg. in all directions for 12 hours) so as to destroy all possible remnants of the growth. This was repeated in one week. A great deal of sloughing took place after these radium treatments. After considerable sloughing of tissues, the wound began to diminish in size and healing is gradually taking place. The man is able to eat semi-solid foods and drinks milk and water without spilling. (Demonstrates how the patient drinks water through a tube without spilling.)

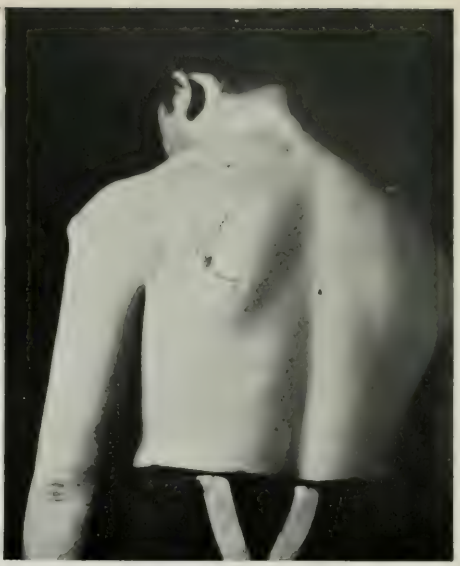
Comment.—In applying the radium in these cases we must drive the dosage to a point where it injures some of the normal surrounding tissues. It is a mistake to assume that radium has a selective power for cancer cells. It is not so. The cancer cell simply succumbs more quickly to the radium than the normal; at least 5 times as quickly; but the normal cell will succumb also when the radium comes in too close a contact with it and is allowed to act for a long period. It is better to destroy or injure some of the normal cells in the neighborhood of the cancer than to permit any of the cancer cells to remain.

The plastic in cases of this kind should not be done until one is reasonably certain that there will be no recurrence (about 1 year after the operation). If the patient does not complain in one year after the operation, it is safe to make the plastic; but if a plastic is made too early then the recurrent cancer will destroy all of the good work done.

Fig. 1.

Angio-sarcoma of the shoulder.

Fig. 2.



Six years later, no recurrence.

Fig. 3.

Carcinoma of cheek. Note sloughing do to radium.

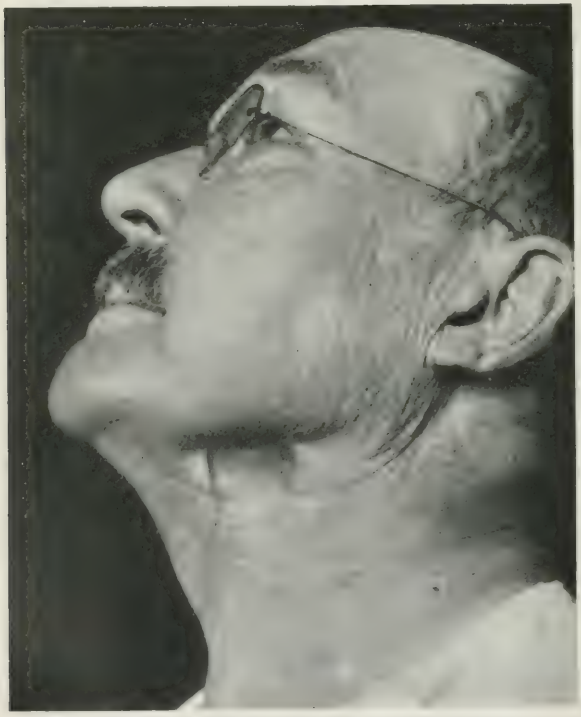
Fig. 4.

Carcinoma of lip and glands in neck.

Fig. 5.

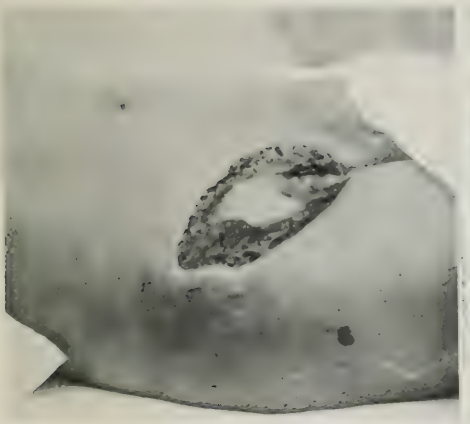
Fifteen months later, no recurrence. Mouth patent.

Fig. 6.



Recurrent carcinoma of submaxillary gland, 3rd operation.
No recurrence after 3 years.

Fig. 7.



Sarcoma of groin 2 weeks after resection.

Fig. 8.

Eight weeks later wound contracted (closed).

Fig. 9.

Carcinoma of breast. Primary open operation.

Fig. 10.

Recurrent carcinoma of the breast 3 years after operation of supraclavicular region.

EXTENSIVE CARCINOMA INVOLVING THE NECK

Epithelioma of Lower Lip with Involvement of the Glands of the Neck.—Patient is 53. Presents a large ulcerated growth involving the entire lower lip, including the angles of the mouth. He is unable to retain the saliva and has difficulty in eating. The right submaxillary gland is the size of a hen's egg. (Fig. 4.) Patient lost considerably in weight and strength.

Past History.—The ulcer first appeared a year ago, in the region of the mucocutaneous border, and gradually grew to the present size. It was first diagnosed as syphilis, although the Wassermann was negative. An extensive anti-syphilitic treatment produced no results.

Examination.—The growth involves the entire thickness of the lip clear to the gingival margin, and there is no mucous membrane left. The right cheek is involved, a hard nodule 6 inches from the angle of the mouth being present. The left cheek and neck are free. No metastases found in the body.

Treatment.—Operation August 13, 1920. Excision of the entire lower lip and both angles of the mouth, and that part of the right cheek containing the nodule, with a good margin of normal tissue. The incision was then carried to the neck and exposed the region of the gland involvement. The entire area was thoroughly exposed and all glands removed.

A suture was made from the angle of the lip to within one inch of the lowest point of neck incision. Rubber drain was introduced to leave the channel for radium introduction. No attempt was made to reconstruct the lower lip, at this time. It will be noted that we left the entire surface exposed to facilitate application of radium and bring direct action on same in cancer bed.

Radium treatment was begun a week after operation. A tube of 50 milligrams was inserted for 4 hours into the lower lip wound in the neck. Application of same dosage was repeated 3 times at intervals of 2 weeks. A total of 1400 mlg. hrs. weekly with X-ray exposures of 4 minutes and spark gap of 8 inches at intervals of three days.

A provision was made for later plastic. A section on each side from the upper lip, each about one-half inch long, was prepared to restore the lower lip. No suturing was done, the two nipple-like portions being allowed to drop down toward the raw surface of the lower lip.

Complete healing has taken place. The border of the mucous membrane from the gingiva has joined the border of the skin of the wound edges of the chin. The patient is able to control the patency of his mouth, is in perfect health, and thus far shows no signs of a recurrence. (Fig. 5.)

CASE IV.—*Recurrent Carcinoma of the Submaxillary Three Times Recurrence.*—This gentleman represents one of the earliest cases in which I have used the open method. Three radical operations, each with rapid recurrence preceded the last operation which took place 2½ years ago. After this last operation he had no further recurrence because of the radium and X-ray treatments directed directly into the wound surface. We may plainly see the incisions and marks of the sutures from his previous operations; but at present there is a perfectly soft scar and a depression, the

previous seat of the tumor. (Fig. 6.) The man has gained 20 pounds in weight, has no signs of recurrence after three years, and occupies an important position with the government.

Case V.—*Sarcoma of the Heel and Groin.* This is an unusually interesting combination. This man is 59 years old. It was not diagnosed until microscopic sections were made. He was treated a long time for syphilis until the glands grew to quite a large size. The heel was amputated and the tumor from the groin excised, and the wounds left entirely open. Radium needles were introduced from time to time especially leading to the borders of the wound as has been done in other cases. Care was taken not to place them in close proximity with the large blood-vessels, for this is dangerous. Radium may produce hemorrhage of the artery, and fatality may result. This large wound on the groin (Fig. 7) which is 5 x 4 inches in diameter gradually contracted down to a scar, a Keloid, such as we see following some clean abdominal incisions. (Fig. 8.) The patient as you note can flex his thigh against the abdomen. The microscopic sections from the growth of the heel and groin proved to be a spindle cell sarcoma (Hektoen). The patient is beginning to walk and is gradually gaining in strength and weight. Several times during the healing process, sections were made from suspicious regions of the wound to ascertain if there was a recurrence. There was none thus far, but it is too early to speak of a permanent result.

Case VI.—*Primary Carcinoma of the Breast.*—This case I present for the purpose of showing the method which I now employ in primary operations for the removal of carcinoma of the breast. The usual radical procedure is undertaken, but instead of suturing the wound as is customary it is left open, only the vessels in the axilla being covered with skin. This procedure I have adopted in order that we may introduce the radio-active substances directly into the field of the cancer and so that radiation may be employed subsequently without the interposition of skin which acts as a barrier and a filter and may be burned by the radium. This procedure has given me more satisfaction than the suturing. It takes less time, does not produce any tension on the skin, rarely any suppuration, and the patient is able to raise the arm without pain 24 hours after the operation. At times I put in 1 or 2 temporary sutures, which are removed in 24 hours. This is done to keep the long flaps of skin

from retracting too much. After they have adhered to the muscles the sutures are unnecessary. (Fig. 9.)

Case VII.—*Recurrent Carcinoma of the Breast (supraclavicular resection)*.—This lady, who is a practicing physician, I have shown a number of times in the various societies as a good example of the efficiency of the method of treatment. The case has been studied very carefully and demonstrates many interesting phases of cancer therapy.

Dr. J. C., aged 48, married; 1 healthy child. The patient developed carcinoma of the left breast in June, 1918. Although it was growing rapidly and she was losing in weight, she refused the removal of the breast until September, 1918, when all axillary glands were involved and a noticeable mass and induration were felt above the clavicle. The breast was removed in September, 1918, with radical removal of all glands and muscles below the clavicle. Daily X-ray treatment was given after the operation to reduce the involvement in the supraclavicular region; but instead of a reduction, the growth increased in size and the arm became swollen. She could not raise it above 90 degrees.

I decided then to remove the skin, fat and all cancerous involvement above the clavicle within reach. This was done on January 21, 1919. An area of 3 inches in width and 5 inches in length was denuded, the clavicle was entirely exposed and as much diseased tissue above the clavicle as was feasible was extirpated; no attempt was made to close the wound. Through the wound X-ray treatments were given daily for two months, and radium was applied once a week for 12 hours. The crater gradually filled up with what appeared to be normal tissue. February 1, 1919, we began the application of adhesive plaster along the edges of the wound, for the purpose of regeneration of the skin. This proved satisfactory and at present the entire wound is covered with dry skin and no recurrence of the cancer has as yet taken place. The patient has been gaining at the rate of 1 to 2 pounds a week since the last operation. (Fig. 10.)

About two years after the operation just described, I presented the case at the Southern Minnesota Medical Association meeting in Mankato in November, 1920, and I pointed out that there was a gland the size of a pecan-nut above the clavicle or the region of the previous operation. That gland had been present for nearly a year without getting either smaller or larger. I concluded that it was an arrested malignancy.

It may seem a paradox to state that we can demonstrate cancer cells in the case microscopically and still pronounce the case non-malignant. The patient was operated upon three years ago and had what we considered a recurrence although she was in perfect health and had gained 20 pounds in weight since the operation, and was

practicing her medical profession. The gland in the neck appeared and never grew any larger and her general condition remained unchanged. We removed some of the gland for microscopic examination and found carcinoma cells encircled by heavy strands of connective tissue; in other words encapsulated groups of cells apparently helpless and unable to regenerate; in other words sterile. We are carefully watching for the enlargement of the glands in the neck; but they do not seem to change in size and her condition remains the same.

I have tried to bring before this meeting a different group of cases from the ten cases that I showed before the Chicago Medical Society two weeks ago. Out of this group of about 100 cases of cancer we have saved about fifteen. This does not include the cases treated by Doctor Joseph C. Beck which represent another group and are practically all head cases, a good many of them being laryngeal carcinomata.

In conclusion I will say that we have saved only a small number of this apparently hopeless group and many of them were made a great deal more comfortable while they lived. On the other hand we have made a very large mortality; but we have felt that we have done harm to none and have benefited a few.

GAS GANGRENE IN CIVIL SURGERY: REPORT OF A CASE

FROM THE SURGICAL SERVICE OF DR. ALBERT E. HALSTEAD

REPORTED

By FREDERICK CHRISTOPHER, M.D.

Assistant Surgeon, St. Luke's Hospital, Chicago, Illinois

To those who witnessed the great frequency of gas gangrene among the war wounded in France, the relatively infrequent incidence of that infection in civil surgery is apt to favor the belief that it is so uncommon as to be negligible. A careful search of recent medical literature revealed only seven writers who reported in all but nine cases of gas gangrene in civil practice.

In Adams'[1] case the popliteal artery and vein were completely severed. Gas gangrene developed and a guillotine amputation was done in the mid-thigh region. The wound was treated with Dakin's solution. After a blood transfusion and the administration of saline and soda bicarbonate the patient made a good recovery. In Divergey's[6] case the patient, whose leg had been injured by a car wheel, recovered after an amputation. (Accident occurred January, 1914.) Schmidt[28] reports two cases from the U. S. Naval Hospital in Norfolk, Virginia. The first was a lieutenant who fell from an aeroplane sustaining a compound fracture at the ankle. The development of gas gangrene necessitated amputation in the lower third of the thigh. Of some interest in this case was the fact that the socks which the patient wore at the time had been worn in the trenches in France. The second case was a compound fracture of the bones of the leg and of the opposite thigh. Gas gangrene developed and despite an amputation, the patient died suddenly, apparently from an embolus. Reifschneider[23] reports two cases, one a gunshot wound, and the other a wound incurred by the explosion of a tank. Both these cases recovered after amputation and the Carrel-Dakin treatment. Baudom[2] reports a case of gas gangrene of the arm which recovered without amputation after the injection of Weinberg's serum.

Hoffman[12] reports a case of particular interest in which gas gangrene developed after an aseptic bone operation. Dirks[4] in 1915 reported a case of gas phlegmone after a criminal abortion.

Despite the paucity of reported cases the writer is inclined to the belief that gas gangrene is encountered rather frequently in civil surgery. Guthrie[9] believes that it is quite common and adds that it has been found in postoperative wounds, after subcutaneous injections, obstetrical operations, animal bites, and goring by animals. The conditions under which the many daily accident cases are occurring and the character of these wounds are favorable to the development of gas gangrene, and all surgeons, particularly those who do a large amount of traumatic surgery, should constantly be on the lookout for its development.

The stimulus of the war has produced a vast amount of work on the subject of gas gangrene until at present it may be said that the etiology, pathology and treatment are very thoroughly, though not entirely, understood. Sacquépee[25], in summing up the research done by the French on gas gangrene, says that the war has shown that gas gangrene is associated with three species of organisms, B. Welchi (the B. perfringens of the French), Vibrion septique, and the B. bellonensis (which probably is identical with the B. œdematiens) acting alone or in association. Jopson[14] reports a case caused by B. Welchi alone. While the soil of France is rich in these organisms, the occurrence of cases of gas gangrene in this country shows that they are also present here. In all crushed wounds where there has been destruction of tissue and interference with the blood supply from injury to the vessels, and where dirt has been carried deeply into the tissues, the development of gas gangrene must be considered a potentiality.

The early diagnosis is of the greatest moment. In a previous communication[5] the writer called attention to the salient factors in making an early clinical diagnosis in cases of war wounds. These are: History of a recent wound, swelling, increased frequency of pulse rate, tympany, crepitus (auscultatory and palpatory), pale color of the skin, odor, ability to "milk" gas bubbles out of the wound, thin discharge, röntgenographic findings, and the maintained intelligence of the patient. At that time, as the serum treatment was considerably less dependable than it is now, bacteriology was not

depended upon to a great extent. Now, Sacquépee[26] states that inoculation with the three serums representing the organisms mentioned above furnishes protection to animals in 96 per cent. of the cases. In availing oneself of the assistance of serotherapy, it is of great value to know which is the predominating etiological agent. De Lavergne[18] tells of a method of making a rapid bacteriological diagnosis of the wound. He injects an emulsion of the wound tissue into three guinea-pigs which are each immune against *one* of the three different causal agents. Naturally, the organism to which the surviving had been immunized is identical with the etiological agent of the wound under consideration.

In regards to the treatment, the preventative is naturally the most important. This consists of thorough early débridement of the wound, irrigation of the wound with Dakin's solution by the Carrel method and delayed closure. It seems very desirable that serotherapy be more used in the preventative treatment. Sacquépee[26] tells of a series of 319 severely wounded cases in which preventative serotherapy was employed. In this series only 1.17 per cent. showed gas gangrene, while in similar wounds not so treated gas gangrene was present in 7.2 per cent.

Once gas gangrene has developed in a wound the first choice of attack is surgical. Radical removal of the gangreneous parts, multiple free incisions, and the Carrel-Dakin treatment should be employed. While it is true, as Weil[32] remarks, that in traumatized wounds one should not place too great a hope on the usefulness of gas gangrene serum yet it cannot be denied that serotherapy will form an increasingly important adjunct to surgical measures. Where serotherapy was used as a curative agent, Sacquépee found that the deaths were only 13 per cent. Klose[16] favors a polyvalent serum and Jopson[13] reports excellent results in a case treated by Vincent's serum. Malone[19] is of the opinion that probably serum will hardly be relied upon in civil practice because of our improved methods of débridement, and because owing to the rare occurrence of gas gangrene, a supply of serum will not be available except in the largest centres of population. It is hoped that the infrequency of the condition will not prejudice the use of an admittedly valuable agent in the treatment. It seems very probable that before long commercial

houses will have appropriate anti-gas gangrene sera available just as readily as tetanus and diphtheria antitoxin are at present.

The following case is deemed to be of sufficient interest to report.

W. G., white, male, aged 50, was admitted to the service of Dr. Albert E. Halstead at St. Luke's Hospital, Chicago, Illinois, on January 23, 1921. The patient was a structural iron worker and was employed in work on a viaduct over some railroad tracks. At the time the accident happened he was standing between two moving trains, when a ladder which a fellow worker carried struck one of the trains and in turn knocked the patient against or under one of the moving cars. He lost consciousness and remembered no further details of the accident. The patient was a very strong, well-built individual of about six feet in height and some 200 pounds weight. The scalp had a small laceration in the occipital region and there was a contused wound about 3 cm. in length over the left eye. The right hand had sustained a severe crushing injury. There was a wound across the palm around the index finger, one along the middle finger, and another extended 2 cm. from the base of the thumb up to the first joint of the index finger. Flexion and extension of all fingers save the fifth were present. The latter remained motionless in flexion.

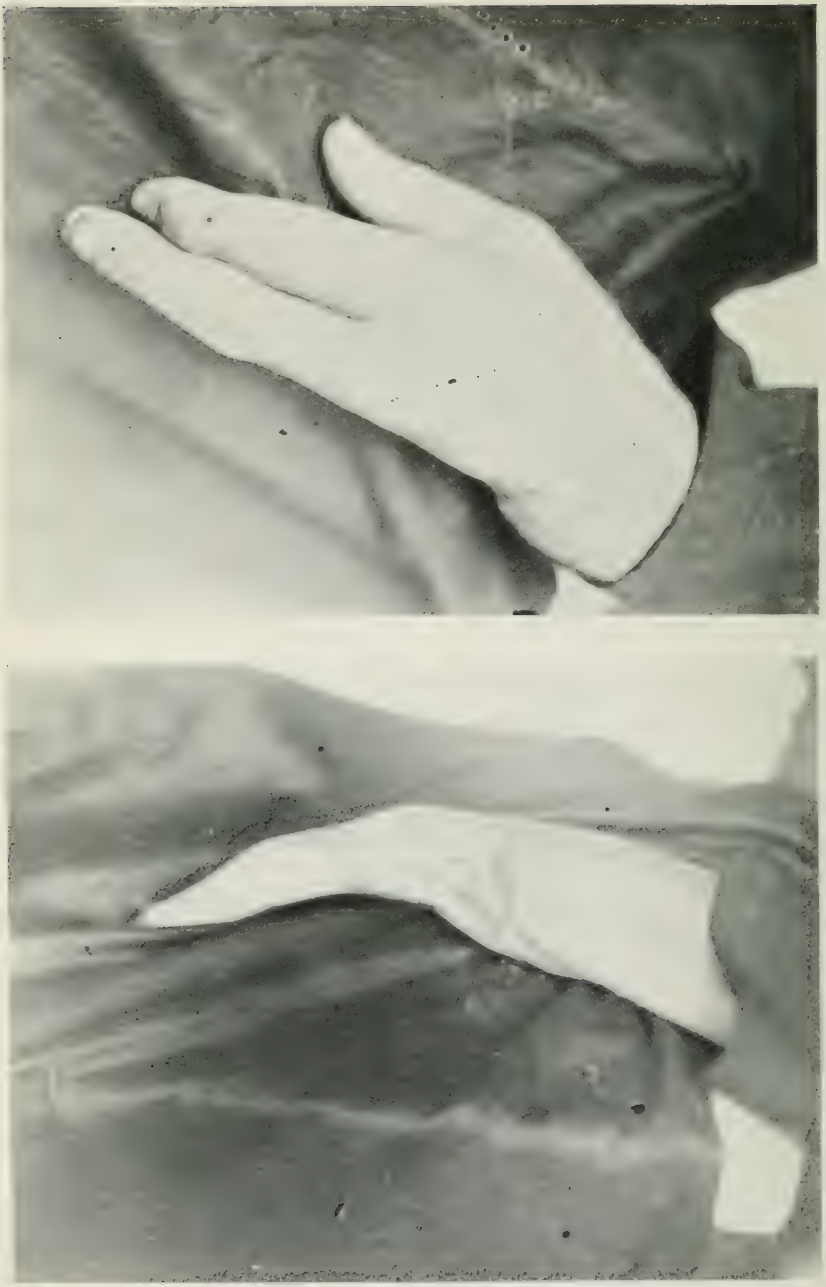
X-ray Report (Dr. E. L. Jenkinson).—Fracture through the distal end of the fifth metacarpal of the right hand. Fracture through the articular surfaces of the distal phalanges of the fourth and fifth fingers. Fracture through the distal end of the distal phalanx of the third finger. Fracture through the distal end of the middle phalanx of the index finger. Comminuted fracture through the distal end of the distal phalanx of the index finger. No evidence of skull fracture.

On admission 1500 units of tetanus antitoxin were given and the Carrel-Dakin treatment of the wound was instituted. On January 24 the wound was dressed by Doctor Halstead and pieces of necrotic tissue were cut away. On January 25 the white blood-count was 15,300. The temperature ranged from 101 to 103.4 (rectal), pulse, 88–118, respirations, 20–24. The sensation of touch was diminished on the anterior and posterior surfaces of the little finger which did not present its normal bright red color. On January 26 the white count was 15,800. The little finger, by this time, was almost entirely

FIG. 1

Appearance of hand February 15, 1921

FIG. 2.



Appearance of the hand August 25, 1921.

Fig. 3.

X-ray examination January 24, 1921, note swelling of soft parts.

gangrenous and was disarticulated at the metacarpal-phalangeal articulation by Doctor Halstead. The necrotic skin edges were cut away. At this time the palmar muscle presenting in the wound had a dark gray appearance and pressure upon it caused gas bubbles to come out of the tissue. On January 27 a culture of the wound was reported as having gas bacilli as the predominating organism, with staphlococci also present. The temperature was 102.6; pulse, 98; respirations, 22. The white count was 16,300. On the 28th and 29th the hand was soaked for an hour in hot boric solution in addition to the Carrel-Dakin treatment and on the latter day, the distal and middle phalanges of the ring finger were removed. The white count was 16,900. The Carrel-Dakin treatment was carefully carried out with daily dressings. The daily temperature ranged from 99.6 to 103 rectal. The white count varied from 12,000 to 20,000. The patient was extremely toxic and on February 7 he was anæsthetized and the fourth and fifth metacarpals and adjacent necrotic tissues were removed by Doctor Halstead. Following this procedure the white blood-count dropped gradually to 8900 on February 17. Frequent smears of the wound were made and gas bacilli were found until February 12 after which none could be demonstrated. Blood culture on February 14 was negative. On February 13, 10 minims of typhoid were given intravenously in an effort to see if the injection of foreign protein would augment the defenses of the body against the infection. On February 15, 15 minims were given; on the 16th, 17 minims; on the 18th, 18 minims; on the 19th, 20 minims; on the 22nd, 17 minims; and on the 23rd, 20 minims. These injections were generally followed by a rather severe reaction in which the temperature reached 103.4 rectal. On February 25 the white blood-count was 10,200; on March 5th it was 11,400; and on March 9th it was 11,800. The wound and the patient's general condition gradually improved. On February 28 the Carrel-Dakin treatment was discontinued and from then on the wound was daily dressed with compound tincture of benzoin. On March 5 the nails of the second and third fingers were removed. After March 8 the patient's temperature remained normal, and his general condition was much improved. Urine examinations on January 24 and February 8 showed a very faint trace of albumin but no casts. The Wassermann was negative. On March 12 the patient was discharged from the hospital to return

for dressings. The patient was readmitted on March 28 when the raw area on the hand was skin grafted by the Thiersch method, by Doctor Halstead, the skin being obtained from the patient's thigh. From this time on the patient's improvement was steady and rapid. On June 26 the patient returned to the Surgical Follow-up Clinic. The wound was completely healed. At this time though there was limitation of motion in the joints the patient was intelligently massaging them. On August 21 the motion was much improved and the patient could write and row a boat.

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LARGE ABDOMINAL LYMPHOSARCOMA

FROM THE SURGICAL SERVICE OF DR. ALBERT E. HALSTEAD

A RAPIDLY FATAL CASE REPORTED

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Lymphosarcoma is an unusual and an excessively malignant tumor. It has been defined by McCallum[7] as a widespread growth arising from a group of lymph-nodes (more rarely from a single one). It fails to respect the capsules of the lymph-nodes, but grows rapidly and invades and infiltrates the adjacent tissues. Isolated metastases to distant organs are said to be rare, but adjacent lymph-nodes may be involved, otherwise the growth tends to spread in loose tissue and in film or plate form over loose surfaces. Bland-Sutton[1] calls attention to the fact that lymphosarcoma arises in situations where lymphoid tissue abounds, *e. g.*, the tonsil, base of tongue, mediastinum, and retroperitoneal tissue. The tumors in the thorax may be great masses of solid tissue which surround the heart. The abdominal tumors may be huge single masses or may so envelop the intestine that it resembles a stiff hose.

McCallum[7] says that it would probably be impossible to distinguish histologically from a single section between an involvement of a node by chronic lymphoid leucæmia, leucosarcoma, lymphosarcoma, and small round-celled sarcoma. Microscopically, the essential characteristic is, as Ewing puts it, a "diffuse growth of lymphoid cells lying in reticular tissue." The cells of lymphosarcoma are identical with those of the round-celled sarcomas (Bland-Sutton), but the cells are contained in delicate meshes. The tissue resembles that of lymph-nodes. The cells vary in size, being small, medium and large, and their nuclei are compact or vesicular, always hyperchromatic and the nucleoli are not prominent.

The differentiation of lymphosarcoma from other hyperplasias of the blood-forming tissues (if we may include the lymph-nodes as among the blood-forming organs) is apt to be confusing. In an attempt to clarify this situation Ewing has classified tumors of lymphoid tissue according to present indications of histogenesis, but

he has found such a classification open to a number of objections. The most satisfactory classification is undoubtedly that of McCallum[7].

HYPERPLASIAS OF THE BLOOD FORMING TISSUES (MCCALLUM)

A. Hyperplasia of lymphoid tissue.	
a. with leucæmic blood	
1. with swelling of lymphoid tissue and lymphoid infiltration of organs	Chronic lymphoid leucæmia Acute lymphoid leucæmia
2. with tumors originating in various situations and invading tissues	Leucosarcoma Chloroleucosarcoma (chloroma)
b. without leucæmic blood	
3. with tumors involving bone marrow	Lymphoid or plasma cell myeloma
4. with general swelling of lymphoid tissue	Pseudoleucæmia
5. with regional invasive tumor-like growth	*Lymphosarcoma*
6. with stigmata of general mal-development	Status lymphaticus
B. Hyperplasia of myeloid tissue.	
a. with leucæmic blood	
7. with myeloid infiltration of organs	Myeloid leucæmia, myeloblastic leucæmia
8. with tumors of myeloid tissue	Chloromyelosarcoma (myeloid chloroma)
b. without leucæmic blood	
9. with tumors of the myeloid tissue	Myeloid myeloma
C. (Included here though probably not related)	
Tumor-like swelling of the lymph-nodes with nodules in the spleen, liver, lungs, etc., granulomatous alteration of lymphoid tissue of specific morphology, apparently infectious in origin	Lymphogranulomatosis, or Hodgkin's disease.

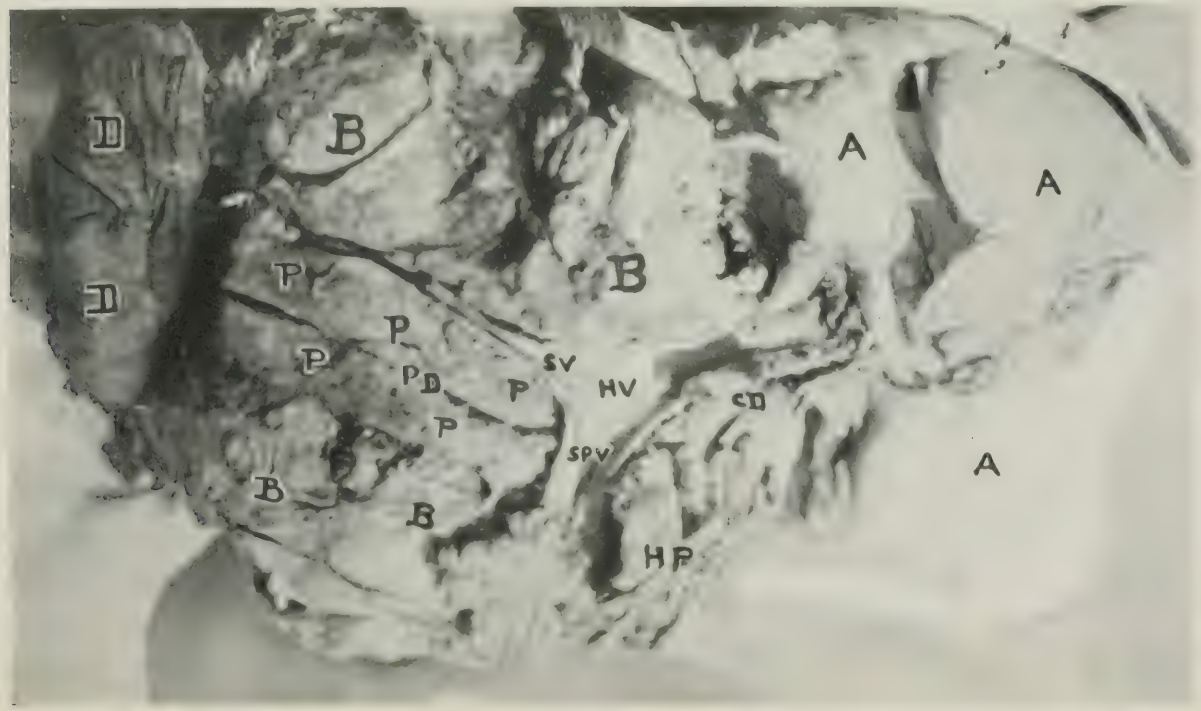
Hirsch[4] has described a case of abdominal lymphosarcoma with rapidly fatal course in which the blood changes were such as might readily be confused with those of leucæmia or a severe primary anæmia.

The following case is deemed to be of sufficient interest to warrant reporting because of its rapid growth to a large size and because of the interesting problem in diagnosis it offered.

Mrs. F. T. (No. 148,735) was admitted to the Medical Service of Doctor Preble on June 19, 1921. The family history was negative. As a child the patient had had whooping cough, measles, and frequent attacks of tonsillitis which finally were corrected by a tonsillectomy. Menses began at 14 years. They have been unaccompanied by pain, have been regular, of the thirty-day type, and have had a duration of four to five days. Last period June 8, 1921. The patient has five children all living and well. No miscarriages. For the last one and a half years the patient has had recurring attacks of indigestion which have steadily been growing worse. These attacks have been characterized by pain in the epigastrium and by nausea, and have been unrelieved by the ingestion of food, water, or soda bicarbonate. They occurred about one-half hour after meals. Eructations of gas, headaches, two or three times weekly, and a foul taste in the mouth regardless of food were present. Four months previous to her admission to St. Luke's Hospital the patient had an appendectomy. Since that time she said that she had "never been right" and had had general weakness and malaise. For the last six weeks the patient has felt a mass in the upper abdomen which gradually has been getting larger and has been getting painful.

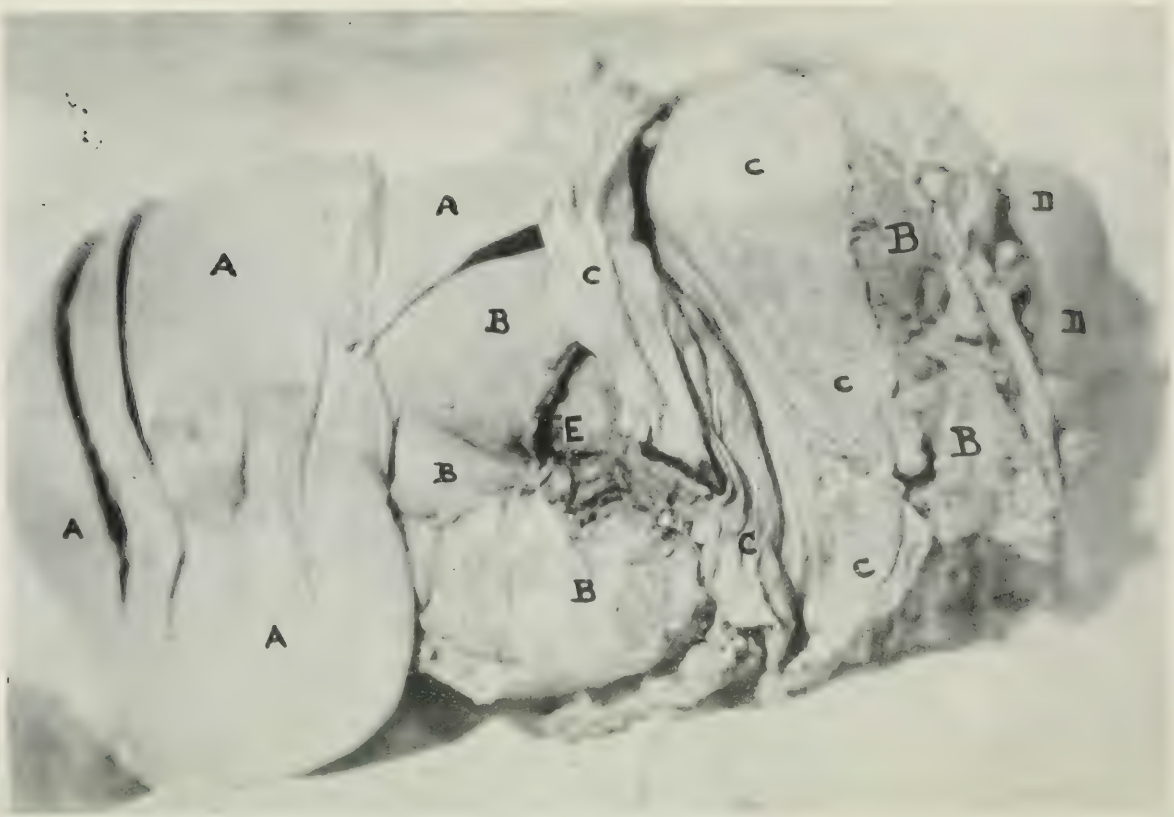
She was a women of thirty-seven years in excellent nutrition. Her skin was of good color, with no œdema or inelasticity. There were palpable posterior cervical nodes on both sides and an enlarged node near the thoracic duct which was thought to be metastasis. No epitrochlear or inguinal nodes were palpated. The auxillary nodes were palpable and the left lobe of the thyroid was enlarged. There is no peculiar formation of the thoracic cavity and the expansion of the chest is equal. Fremitus of equal intensity on both sides. Resonance everywhere normal. Auscultation gives normal ratio expiration and inspiration. No râles. There is a firm smooth rounded tumor mass in the epigastrium which measures about 15 cm. in

FIG. 1.



Tumor and adjacent organs viewed from behind. AAA—Liver. BBBBB—Tumor mass. DD—Spleen. PPPPP—Pancreas. HP—Head of pancreas. PD—Pancreatic duct which has been opened up. CD—Common bile duct which has been opened up. HV—Portal. SV—Splenic vein. SPV—Superior mesenteric vein.

FIG. 2.



Tumor and adjacent organs as viewed from front. AAAA—Liver which has been cut into in the course of the post-mortem examination. BBBBB—Tumor mass. CCCCC—Stomach which has been opened and reflected to both sides. It may plainly be seen how the stomach lies in a groove in the tumor. DD—Spleen. E—Wound in tumor made at time of operation by removal of piece of tissue for histological examination.

Fig. 3.

X-ray of stomach following borium meal, showing the stomach to be elongated, compressed and moved to one side by the tumor. The absence of signs of invasion of the interior of the stomach by the tumor is also noted.

diameter. It moves slightly with respiration. It is somewhat tender to palpitation. The mass pulsates, but the pulsation seems to be of a transmitted rather than of an expansile type. It was not possible to decide whether or not this mass was continuous with the pancreas, spleen or liver. Deep and superficial reflexes present and not exaggerated. No Babinski, no clonus.

X-ray Examination (Dr. E. L. Jenkinson).—There is a large mass in the right upper quadrant which is not freely movable and is not connected with the stomach. The mass, I believe, is located above the stomach and on about the same antero-posterior plane. On palpation, the mass can readily be separated from the stomach. The mass is circular in outline and presses against the lesser curvature. There are no filling defects on either curvature. The pylorus is regular in outline, but flattened on the lesser curvature side due to lesser ventricular pressure. The duodenal bulb is regular in outline. The stomach empties normally. At the end of five hours the barium has passed from the stomach into the small bowel. The small bowel is empty at the end of twenty-four hours. The cæcum is normal in outline. The transverse and distal colons are spastic. The mass in the upper right quadrant does not involve the small or large bowel. The colon fills readily showing no defects or obstruction. The rectum and sigmoid are somewhat dilated. The distal colon is normal in outline. The transverse colon is low and not freely movable. The ascending colon and cæcum seem to be somewhat dilated.

Summary.—Large mass in the upper right quadrant not connected with the stomach or bowel. I do not believe the mass is due to a tumor of the pancreas. Mass moves with the liver, and I believe is due to pathology therein.

Wassermann negative. Erythrocytes, 4,300,000. Leucocytes, 7000. Hemoglobin (Tailquist), 90 per cent. Differential count: Small lymphocytes, 27 per cent.; large lymphocytes, 3 per cent.; polymorphonuclear neutrophils, 70 per cent. Urine: Albumin, negative; sugar, negative; color, straw; reaction, acid; specific gravity, 1021; no casts, frequent epithelial cells, few erythrocytes, frequent leucocytes, bacteria present. Equal amounts of urine and starch solution, after one hour's incubation, show no color change, upon the addition of iodine, indicating a positive reaction for the presence of starch splitting ferments.

On June 29, 1921, the patient was transferred to the surgical service of Dr. A. E. Halstead, who performed an exploratory laparotomy. The great omentum was somewhat adherent to a large purple blue mass which occupied the upper abdomen. The mass seemed to be adherent to the liver but not to the stomach. It was not possible to reach beneath the tumor. An exploratory puncture of the tumor revealed a bloody fluid. On palpation the tumor was soft and almost fluctuating.

About 12 hours after operation the patient became much weaker and despite stimulation died at 1 P. M. June 30, 1921, or 26 hours after the operation.

The post-mortem examination which was made by Dr. Edwin F. Hirsch, revealed in the body only such changes as concern directly the tumor mentioned and in the following brief of the post-mortem record only these are given: "In the mid-line of the body in front, bounded above and to the right by the under surfaces of the left and right lobes of the liver, above and to the left by the lesser curvature of the stomach is the anterior surface (14 x 13 cms.) of a smooth encapsulated tumor which fills the space posteriorly to the vertebral column. There are a few fibrous adhesions between its front surface and the omentum. There is an irregular roughly round opening in front 3 cm. in diameter. When completely exposed this tumor is 21 cm. wide, 18.5 cm. long, and 9 cm. thick. There is a groove on its anterior surface 2.5 cm. to 4 cm. deep in which lies the lesser curvature of the stomach. The lining of the stomach is unchanged. The capsule of the tumor is adherent by fibrous tissue to the under surface of the liver, to the anterior surface of the pancreas, and to the hilum of the spleen. The attachment to the front of the pancreas is quite firm and the pancreatic tissue itself has been penetrated, particularly in its middle third. On the anterior wall of the splenic vein, 3 cm. from its union with the portal, there is an elevated slightly nodular area of tumor tissue 3 cm. long and 1 cm. wide. There are no changes in the pancreatic or common bile ducts. On the surfaces made by sectioning the tumor (hardened) there are large areas of darkened red blood, intimately mixed with a friable white tissue without appreciable supporting stroma. The white fibrous tissue capsule averages 1 to 2 mm. wide. In the left groin under Poupart's ligament is a nodule of soft friable tissue mottled with hemorrhages

about the size of a pigeon's egg. There is a similar one just above the inner end of the left clavicle, and also one opposite the 9th and 10th right ribs along the attachment of the diaphragm, the first about the size of a large goose egg, the other, half as large." The body elsewhere is without particular interest. Summary of anatomic diagnosis: Huge primary lymphosarcoma of the prepancreatic fascia; metastatic sarcoma nodules of the left groin, left supraclavicular fossa, and diaphragm; tumor displacement of the abdominal viscera.

Histologic examination of the tumor and its metastases illustrated the cellular structure of a lymphosarcoma.

The writer desires to express his thanks to Dr. Albert E. Halstead for permission to report this case.

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OS TRIGONUM INJURY

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Anatomy.—The posterior portion of the astragalus is continued backward into a projection which is grooved by the tendon of the flexor hallucis muscle which runs obliquely downward from without inward. The lateral border of this groove is the posterior tubercle. The median border is the posterior internal tubercle. In 7 to 8 per cent. of cases the os trigonum is present as a separate bone on the outer aspect of the external tubercle. The inferior surface of the os trigonum continues the articulation of the astragalus with the os calcis. V. Bardeleben found this bone as a distinct piece of cartilage in the second month of embryonic life and it is considered homologous with the supernumerary os triangulare of the wrist. It is found constant in marsupials of the order having five toes.

The question whether the os trigonum was a separate bone or a fractured posterior process has received some attention.[1]

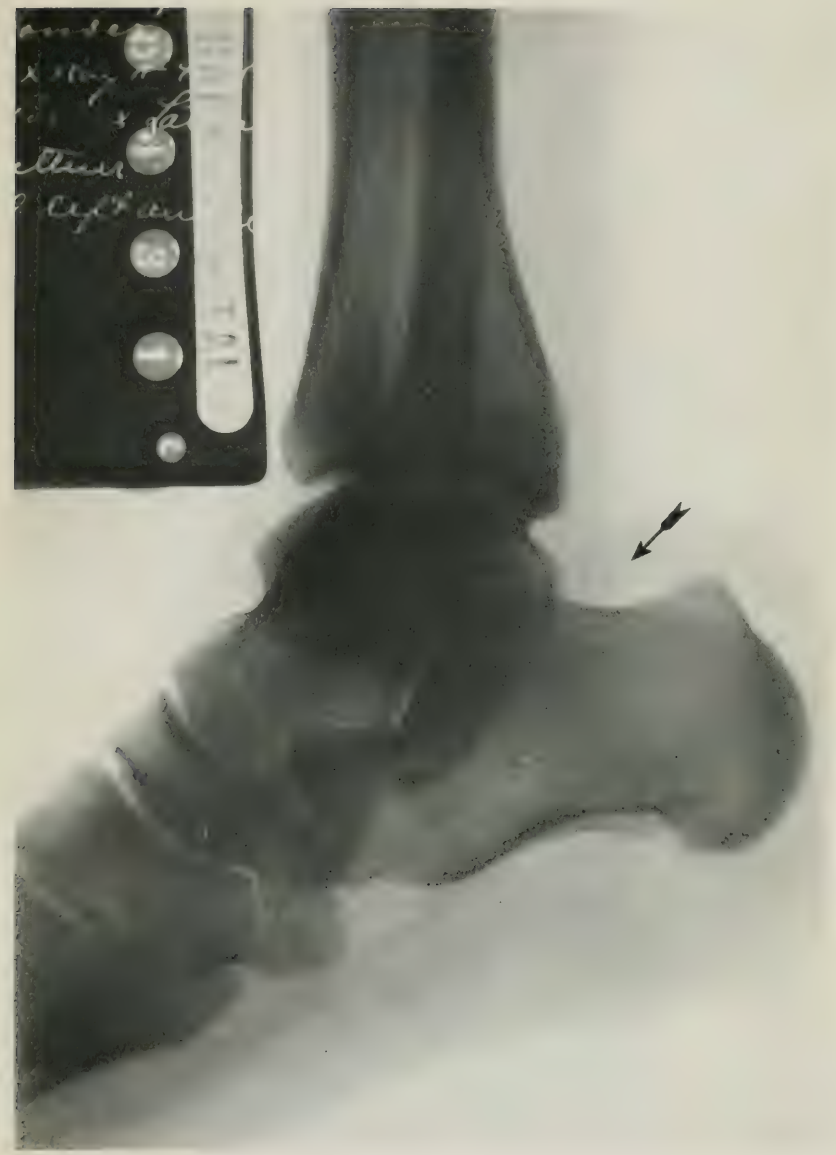
Pfitzner contends very strongly that it is not the same as the tubercle. In the writer's case it is noted in the injured foot (Fig. 3) as well as in the injured. As it is so often seen in cases where there is no violence whatsoever it may readily be accepted as a separate bone.

CASE REPORT

Etiology.—The patient, 33 years old, a switchman, injured his left ankle while "throwing a switch." At the time of the accident his left heel was resting on an elevation and his toes were pressing against the "latch." His toes slipped off and the foot was forcibly thrown into extreme plantar flexion.

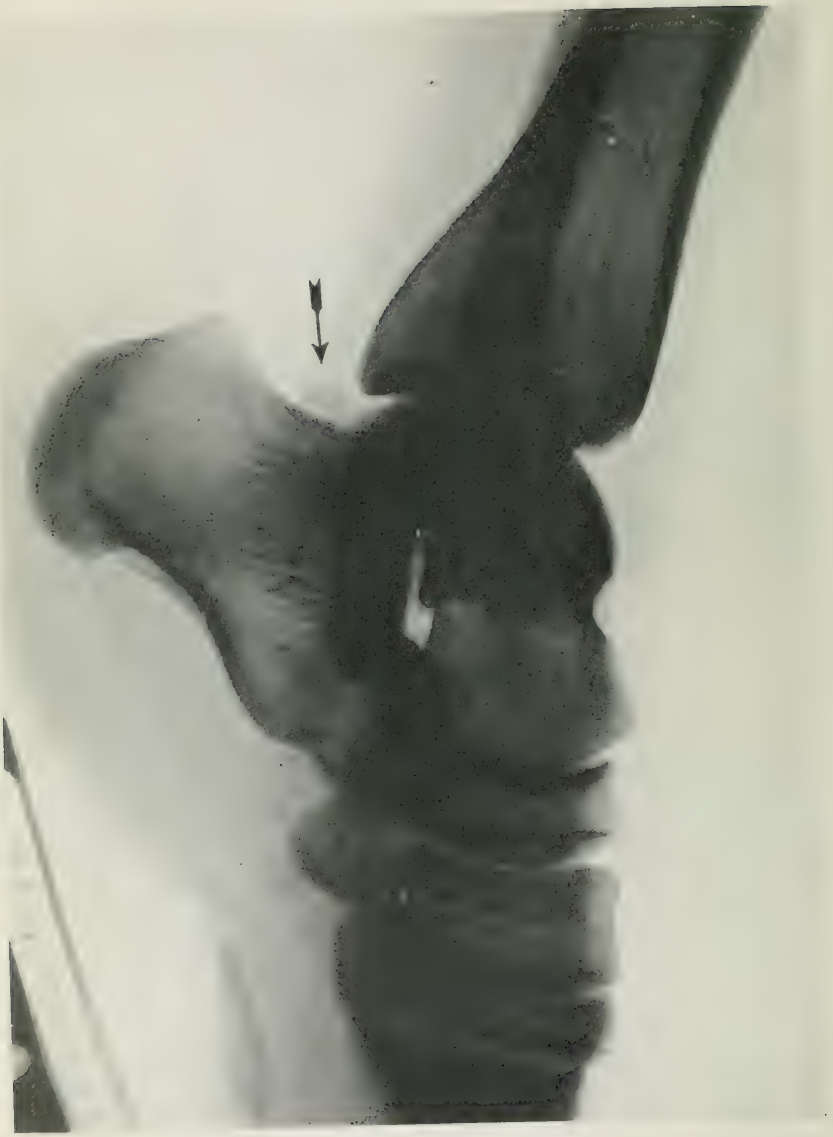
Symptoms.—Immediately following the injury the patient complained of severe pain in the posterior region of the ankle. The pain was aggravated by dorsal flexion and especially by forced plantar flexion of the foot. The pain was worse at night. When asked to point to where the pain was he placed his index finger and thumb, straddling the tendon of Achilles, below and posterior to the malleoli.

Fig. 1.



Os trigonum injury.

Fig. 2.



Os trigonum injury.

Fig. 3.

Os trigonum injury.

There was swelling of the soft parts in this region. Pressure of the region over the os trigonum elicited exquisite pain.

Course.—With rest in bed and massage the pain and tenderness disappeared in a week or ten days and the patient returned to work.

Mechanism.—The day after the injury an X-ray picture, lateral view, taken of the foot at right angles to the leg, showed that an os trigonum was present (Fig. 1). The relationship of the os trigonum to the posterior border of the tibia and the upper surface of the os calcis was noted. It seemed reasonable to assume that if the foot were placed in extreme plantar flexion the os trigonum would be squeezed between the posterior border of the tibia and the upper surface of the os calcis.

A second X-ray was taken of the injured foot. This time the foot was placed in plantar flexion, as it was at the time of the injury, but to a less degree probably. This showed (Fig. 2) the upper surface of the os trigonum in very close proximity to the posterior border of the tibia. And it is readily seen that with forced plantar flexion as at the time of the injury, the os trigonum would be squeezed between the tibia and the os calcis and that the above symptoms might result.

An X-ray (Fig. 3) of the uninjured (right) foot taken with the foot in extreme plantar flexion showed an os trigonum also and the same intimate relationship to the posterior border of the tibia and to the os calcis, a position which renders it liable to a squeeze in forced plantar flexion.

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INCOMPLETE PROLAPSE OF THE RECTUM

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Prolapse of the rectum or procidentia, as it is sometimes called, is the descent of one portion of the rectum or anal canal into or through a lower portion. The prolapsed portion may or may not appear externally.

This sagging may be limited to the separation of the mucosa from the muscle walls, a condition termed incomplete prolapse; or all the walls of the bowel may be invaginated into or through a lower portion of the rectum, constituting a complete prolapse. When the upper rectum or sigmoid intussuscepts, it may include a fold of the peritoneal wall. A prolapse of that part of the rectum above the pelvic floor may not present at or protrude from the anus, and, if it does not appear at the perineum, it can be recognized only by digital or specular examination. This supra-pelvic prolapse accounts for many cases of intestinal stasis and of sigmoid accumulations.

The pathology is the same whether the rectum protrudes or not, although some authors distinguish an internal and an external degree.

INCOMPLETE PROLAPSE OF THE RECTUM

Incomplete or partial prolapse often is merely an everting or rolling out of the mucous membrane of the lowest part of the rectum, and occurs usually in children under five years of age or in the aged, although it may occur in robust adults, particularly in women with lax perineums. Vice versa, children nearly always present the incomplete variety of prolapse. It is also associated with hemorrhoids, rectal polypi, or straining at stool following severe diarrhœa. In this variety the mucous membrane always protrudes from the anus.

This partial procidentia is an exaggeration of the physiological eversion which occurs at every normal stool. Ordinarily the loose connective tissue stretches somewhat to facilitate the ejection of the feces, and then contracts and reacts. When this areolar tissue does not have this elasticity the mucous membrane protrudes abnormally, and is not drawn back again.

In adults this form of prolapse occurs generally in old age when the muscular tonicity weakens, and it is usually associated with or perhaps brought on by vesical or pulmonary complications which produce straining or coughing.

Etiology.—The straightness of the infantile sacrum predisposes, as does the relaxed condition of the muscles and other fibrous structures about the anus, so frequent in anæmic, tubercular, tabetic or otherwise debilitated subjects, from the abstraction of fat from the peri-rectal cellular tissues. The exciting cause, however, is usually straining at stool during periods of constipation or diarrhœa, and often as a result of the child being required to sit at stool for a long time until the bowels have emptied. This unfortunately common practice results in much mischief by mothers not knowing of this danger when training a child. Other causes are the straining incident to phimosis, stone in the bladder, or intestinal worms. Prolonged coughing or screaming may also be a cause.

Symptoms.—The onset of incomplete prolapse is insidious. Sometimes the prolapse can be demonstrated by the patient at stool, or it may require an enema to excite the bearing down. In mild cases the mucous membrane protrudes only during defecation and returns spontaneously or by the patient's manipulation, and remains so until the bowels move next time. Sometimes the whole anal ring seems to be involved when the protrusion is large. At first the mucous membrane is normal in color, but after repeated protrusions it becomes deep red or sometimes scarlet or livid in color, depending upon the condition of the sphincter. It is, however, quite painless. The surface is marked by the intestinal folds which run longitudinally up and down the long axis of the prolapse instead of circularly around it as in the complete variety. Later, when the mass has repeatedly protruded, it will become œdematous, inflamed and difficult to replace. In old and frequently prolapsed cases the sphincter is relaxed, and though the mass may be easily returned, it will not remain so. Ulceration may result from trauma at any time, and the mass will be red, bloody and very painful, but strangulation or sloughing is rare in this incomplete form of prolapse. When only the mucous membrane is prolapsed the tumor is thin, and by digital examination will be found to be continuous externally with the skin, and internally with the mucous membrane. When

this form of prolapse is associated with hemorrhoids or polypus, as frequently occurs in the aged, the mucous membrane will be found sagging between the tumors, and a discharge of blood, mucus and pus will occur with each bowel movement. Hemorrhoids and prolapse are very frequently associated, and the prolapse may involve all or only a part of the circumference of the anal opening. It must be remembered that an internal hemorrhoid may be the primary cause of the prolapse, especially a lateral pile, only one side of the bowel coming down. The pathology is that the pile excites the bowel to contraction, and in endeavoring to expel the tumor the mucous membrane is dragged down with it. This mechanical dragging down of the mucous membrane may be caused by any tumor, polypus, or a foreign body. In a similar manner increased peristalsis and straining due to intestinal worms, rectal ulcers, dysentery, constipation, proctitis, urethritis, urethral stricture, enlarged prostate, cystitis or vesical stone will develop rectal prolapse.

Another factor tending to exaggerate the prolapse is weakness or paralysis of the anal sphincters. This may result from repeated prolapses. In adults it comes on gradually, as a rule, although it may occur suddenly. The more frequently the bowel protrudes the more stretched and relaxed the parts, and this weakened condition in turn favors future prolapsing. Conditions producing œdema of the pelvic tissues such as pregnancy, fecal accumulations, and hepatic troubles induce prolapse by allowing a stretching and separating of the connective-tissue fibres. Incision of the sphincter, or the trauma of a completely lacerated perineum, or the relaxation resulting from sodomy, by weakening the sphincteric narrowing of the anal outlet are predisposing factors.

Diagnosis.—Incomplete prolapse is easily differentiated from the complete variety. In the incomplete, the folds of sulci radiate from the centre, whereas, in the complete prolapse, they are circularly around the cone-shaped tumor. The incomplete prolapse is small, less than two inches projecting, while the complete variety is larger, usually five to six inches long.

Prolapse is more easily diagnosed in adults because of their ability to coöperate in the examination and to give an intelligent history. The tumor of the prolapsed bowel is differentiated from polypus by

having a uniform appearance and by terminating in the rectal wall, while a polypus always has a pedicle, and the larger the tumor the more pronounced and longer is the attachment.

External hemorrhoids, if of the thrombotic variety, are hard, smooth and always separate and distinct tumors which are freely movable.

Internal hemorrhoids may be difficult to differentiate, but the prolapse usually involves the entire circumference of the bowel and has a soft, velvety feel, and if carefully examined, a slit-like opening will be found in the lower end through which the finger can be introduced into the bowel.

The age of the patient will be of some assistance, as hemorrhoids and polypi are uncommon in children, and the protrusion is more likely to be prolapse.

Complications.—As a result of excessive spasm of the sphincter and the trauma of repeated manipulations, the epithelium is abraded resulting in ulcerations, submucous abscess and fistula. Sometimes considerable sloughing of the parts may occur.

Treatment of Incomplete Prolapse.—The removal of the cause is our first consideration because that modifies our course of procedure in each case. Urethral stricture, phimosis, vesical stone or rectal polypi must be relieved, habits such as prolonged sitting on the chamber, must be stopped immediately, and pinworms must be sought out and destroyed.

In early childhood the rectum is straighter and more vertical and more movable than in later life. The sacrum is straighter also and makes the rectum an abdominal organ. The connective-tissue structures between the mucous and muscular coats of the bowel are also more lax in children and prolapse quite often occurs when straining continues for even a few successive days or weeks.

In children prolapse can usually be cured without surgery after removing the exciting factor. The child must have easy evacuations without straining and a suitable cathartic or an enema must be administered as needed. The child should be taught to empty the bowels while lying on his back on a bed-pan instead of squatting on a chamber. Electrical stimulation to the anus and plenty of fresh air often work wonders in these cases. If the prolapse protrudes between times for stool, showing that the sphincter is relaxed, the

buttock should be kept carefully strapped together. A cold enema given just before defecation will secure an easy movement promptly.

Rickets is an important etiologic factor in the causation of prolapse of children and demands energetic treatment.

Where prolapse is caused by acute inflammatory intestinal disease the prolapse should be sponged with warm solution of Hamamelis or Fl. Ext. of Hydrastis. Inject a little of the solution up into the bowel. Give opiates to control peristalsis, and a liquid concentrated diet.

In aged persons and in tabetics the palliative measures employed with children do not cure because the relaxation or stretching of the submucous connective tissue is not so readily overcome, and various surgical measures tending to produce a cicatrix have been devised which narrow the anal canal. Hemorrhoids, polypi or other neoplasms must be removed, and the operation necessary for that purpose will usually effect a cure. The injection of irritants into the submucous tissue is condemned as dangerous.

The radical cure consists in the removal of part or all of the prolapsing tissue and may be performed under local anæsthesia. An elliptical-shaped piece of loose membrane may be removed at three or four points around the prolapse. The redundant tissue is grasped in a hemorrhoidal clamp and cut away, and the edges carefully sutured together. This operation is very similar to that for hemorrhoids, and the same rules are to be observed when operating, *viz.*, the long axis of the wound must be parallel to that of the rectum, the muco-cutaneous edge must not be included, and too much of the anal circumference must not be removed.

Complete removal of the prolapsed rectum is in truth a Whitehead operation, which, if performed, must be guarded with most rigorous aseptic technic, careful adjustment of the wound edges, and the placing of the wound wholly within the anus so as not to involve the muco-cutaneous border.

Reducing the Prolapse.—Often the immediate service required of the surgeon is to reduce the prolapse. When the prolapse is recent, or of small degree, it ordinarily reduces spontaneously, or it is replaced by the patient or attendant. When this cannot be done the surgeon is called in. On inspection it is important to note if the procidentia is complete or incomplete and then the condition of the

mucous membrane as to the presence of strangulation, ulceration, or sloughing. If the prolapse has been exposed for a considerable time and the sphincter is contracted, great swelling and œdema of the tissues occur. Replacement should first be attempted without a general anæsthetic in order to avoid the subsequent vomiting and straining which might cause the prolapse to recur. But if after a reasonable effort with careful manipulation the tumor cannot be reduced, it is always advisable to promptly administer an anæsthetic, dilate the sphincter and replace the gut.

To reduce the procidentia, place the patient in the knee-chest or Sims position, with the hips well elevated. Cover the entire tumor with a hot cloth, not a cold one, and slowly reduce the mass. Under continued pressure with a hot compress and gravity the circulation improves, œdema is forced out, a hernia, if present, will reduce, and then the procidentia slips in. Be very careful not to bruise the parts. The inner layer of the bowel should be assisted up as the reduction is accomplished by introducing the finger, covered with gauze or tissue paper, into the lumen and gently pushing upward. As the finger is withdrawn the gauze or tissue paper is left within and assists in preventing a recurrence of the prolapse.

It is imperative that spasm of the sphincter causing constriction must be relieved by division or divulsion of the sphincter. If there is any question as to the viability of the prolapsed gut the tumor should be covered with three or four layers of towels wrung out of hot water. After these towels have been carefully wrapped around the bowel, hot water should be continuously poured over the towels to keep them hot for an hour. By persisting in this hot douching for an hour an apparently hopeless case may recover.

Following the reduction of the prolapse a considerable tenesmus may occur. This is best relieved by spraying the bowel through a proctoscope with a 1 per cent. solution of silver nitrate.

In the Case of Children.—The child should be laid across the knees, and gentle pressure made upon the whole mass of the tumor to empty it of its blood, and thus reduce its bulk. After this reduction proceed by first returning the bowel forming the apex of the cone. The parts are usually irritated and sensitive, and in infants struggling and straining are always encountered. In some cases, even in children, the administration of an anæsthetic will be necessary to relax the sphincter before the prolapse can be reduced.

Every manipulation must be carried out with firmness but gentleness that bruising of the tissues may be spared and thus the future conduct of the case made easier.

When gangrene or sloughing has occurred be very careful to determine the depth of the slough before reducing the protruding gut. If perforation has occurred or is likely to occur, reduction is questionable as peritonitis may result and the prolapsed parts had better be amputated immediately. After reducing the prolapse, strap the buttocks together and confine the patient to his bed. Have the bowels emptied in the reclining position.

The after-treatment of prolapse in children requires considerable individual attention. The child should have evacuations while lying on his side. To retain the rectum after it is replaced, the buttocks should be supported with adhesive straps, three inches wide, which are to be applied while the child is lying down. Attach the strap to one trochanter, pass it over the buttock, folding the cheek in and against the opposite buttock, crowd the opposite buttock inward and pass the strap on to the trochanter. The strap is so placed that its posterior edge is just in front of the anus. In this position it is not soiled by the defecation and therefore need not be removed for a week or ten days. Frequent changing of these straps causes abrasion of the tender skin.

In aged patients or others where the prolapse easily occurs while the patient is at stool and where surgery is contra-indicated the patient's bowel should be moved while he is in a reclining position, and better only at night just before retiring. Chronic constipation is a most frequent cause in these patients, and a proper regulation of the bowels is of prime importance. Women, who as a result of repeated pregnancies, have greatly relaxed pelvic and abdominal muscles are much benefited by massage and gymnastics. This method of treatment is easy of application, devoid of danger and is deserving of a trial.

Compresses and pads applied to the anus defeat their very purpose because the pressure upon the sphincter causes relaxation and dilatation of the muscle. These tentative measures may be tried for two or three months if improvement is apparent, but if the prolapse increases in spite of this treatment, or if spasm of the sphincter and strangulation of the gut occur, operative treatment is required.

Operative Treatment.—Where acute strangulation exists, division of the constricting band, which is usually the sphincter externus, and reposition, if the position of the gut will admit, or amputation where in doubt as to the integrity of the prolapsed bowel is the only rational treatment.

Cauterization of the prolapse, as recommended by Van Buren or Allingham, is often successful in the early stages of a first degree of prolapse, but when the tumor is large and thick such treatment will not effect a permanent cure. These methods of using the actual cautery are frequently followed by extensive sloughing of the gut, secondary hemorrhage and death. In other cases where the prolapse is cured cicatrical stenosis of the rectum may follow. The depth of the eschar cannot be accurately gauged, and slough of the whole surface of the bowel, with hemorrhage or sepsis following, is likely to occur.

The removal of elliptical strips of mucous membrane is much more surgical and produces better results. The technic of this operation is similar to that of hemorrhoidectomy and need not be repeated here. It may be advantageously applied in prolapse of minor degree, particularly where the mucous membrane alone is protruding. In cases of complete rectal prolapse it is inadequate.

OSTEOMYELITIS OF THE CALCANEUM

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As in other infectious processes, osteomyelitis of the calcaneum offers a great variety to clinical forms, resulting from the disturbances wrought in the organism by the bacterium in play. In fact, the bacterium is not always the same and does not always possess the same degree of virulence while, on the other hand, the organism of each patient reacts in a different manner to infection. The principal clinical types met with are four, the first of which is the superacute form, this corresponding to Gangolph's so-called fulminating osteomyelitis, in which the local symptoms are completely overshadowed by the train of severe general symptoms.

The onset of the process is ushered in by a very sharp pain in the heel while at the same time or very shortly after, serious general phenomena develop, characterized by a violent chill, a sharp rise in the temperature which reaches 40°C. (104°F.) or more, headache, low delirium and diarrhœa. The pulse is miserable, while the look of the patient is that of typhoid fever. Albumin appears soon in the urine.

Since the sharp pain develops at the onset in the proximity of the tibiotarsal joint, the general symptoms may absorb the physician's attention and lead to an erroneous diagnosis of cerebral rheumatism. Death ensues either from some cardiac complication or else from a general osteomyelitis septicemia. The local phenomena are not more marked than in the acute form which will now be considered.

This form, more frequent than the superacute, is less liable to give rise to mistakes in diagnosis. The general symptoms are not as severe, while the local symptoms are, therefore, more readily recognized.

(a) *General Symptoms.*—The patient, most usually a child or adolescent, is seized in full health with slight fever, following a long tramp in the country, a walk in the rain or the receipt of an injury. The pyrexia is rarely preceded by chills, but is accompanied by headache, thirst, anorexia and occasionally restlessness. The pulse is rapid, the tongue coated and dry. These symptoms are frequently

sufficiently marked for an onset of typhoid fever to be suspected, but the prostration is always less marked in osteomyelitis than in typhoid infection. Then the coincidence of the local symptoms will help in making the diagnosis.

(b) *Local Symptoms.*—The first phenomenon to which acute osteomyelitis of the os calcis gives rise is local spontaneous pain, distinctly confined to the heel. At first dull and intermittent, it becomes very quickly continuous with nocturnal exacerbations. Pressure over the parts increases the pain to such a degree that narcosis may be required for carrying out the examination properly. The slightest movement may give rise to atrocious pain in the more serious cases. Standing up exaggerates the pain so that the child will stand only on the healthy limb.

The perimalleolar region offers considerable swelling and over the developing abscess in the bone there is a hard deep-seated induration, while the surrounding parts are the seat of œdema which may extend up to the middle of the leg and downward over the entire foot. The skin is red and presents a marbling over the instep due to the dilatation of the subcutaneous veins, especially numerous in this region.

The general symptoms slowly subside, the œdema loses its hardness and then fluctuation can be made out in the abscess in the os calcis. If the purulent collection is not opened it will work its way through the bone and integuments, giving rise to interminable sinuses, from which a creamy greenish fluid, containing fat droplets makes its exit. If these sinuses be explored they lead directly down upon denuded bone.

On account of the pain and deformity of the heel the foot assumes the equinous attitude, but the movements of the tibiotarsal joint are possible and only become painful when they are exaggerated.

The chronic or prolonged form of the process under consideration occurs as follows: After the disappearance of the general phenomena, the local symptoms gradually subside in intensity and thus the acute form undergoes an evolution toward the chronic prolonged state. At this phase of the process only a deformity of the heel and sinuses exists.

Usually the patient believes himself cured and if allowed, will return to his ordinary occupations, as only a little pus makes its exit

from time to time or the sinuses may even close. Then after a variable lapse of time without any apparent cause or if a trauma is inflicted, pain returns and is especially sharp toward evening. It is at first bearable so that the patient continues work, but little by little it assumes the same character that it had during the acute phase of the process and finally reaches exacerbations of extreme violence.

During all this time the skin will have remained thick and shiny; the subcutaneous veins are dilated and present a very appreciable violet network over the instep. When palpation of the region is undertaken, one is struck by the degree of bone hypertrophy present; the os calcis will be found twice its normal size. The leg is thin, as well as the metatarsus on account of muscular atrophy. This is especially evident in the extensor muscles of the joint, and is likewise marked over the posterior aspect of the leg. It consequently results that the antagonistic muscles are no longer counter-balanced in their action, therefore producing club-foot. However, the vicious positions of the foot that are encountered at the onset of the chronic phase of the process do not result from the atrophy but from the contraction of certain muscles; they have the same origin as those of the acute period.

Generally speaking, the size of the diseased area increases in extent at about the same time that the pain recurs. The soft structures covering the calcaneum are almost invariably the seat of abscess formation, due to one of two causes. Either they are abscesses due to direct extension of the process in the periosteum to the cellulo-fatty layer covering it or else they are derived from the bones and then they give rise to sinus formation. The former can be recognized from the fact that when they are opened no denuded bone can be detected at the bottom of the abscess.

The sinuses arising in osteomyelitis of the os calcis have a peculiar look. Their edges are rigid and adherent and they give issue to a thick, well-mixed greenish pus. A sound can be introduced into their external apertures and the resistance of their walls, unlike the friable condition found in tuberculous sinuses, is diagnostic and sequestra will be detected. These are completely movable or may be still adherent to some of the living bone. The sensation experienced in this examination when the sequestra are touched with the sound is quite different from that when the os calcis is the seat of a tuberculous

process. Instead of providing fine crepitation due to tearing of the bone lamellæ, the instrument gives rise to a dry sound.

Prolonged chronic osteomyelitis of the os calcis may only give rise to pain without sinus formation or deformity, but this condition of affairs is not common.

Osteomyelitis, chronic from the onset, undergoes its evolution without being preceded by the acute phenomena described in the case of the other forms. It presents the phase of suppuration, necrosis and sinuses of prolonged osteomyelitis. In the first place this form manifests itself by two principal symptoms, *viz.*, pain and swelling of the involved bone.

This form offers considerable difficulty in diagnosis as it assumes somewhat the symptomatology of osteosarcoma of the os calcis. The

FIG. 1.

Osteomyelitis of the posterior aspect of os calcis. Sequestrum seen from the side.

soft structures remain in a normal state for some time, often very long, until the day when complications set in. When these occur they usually represent a suppurative process and then the general health becomes affected and there is pyrexia, and from this time on, the chronic form of osteomyelitis from the onset enters into the same class as the chronic prolonged form, giving rise to the same mistakes in diagnosis, consequently in treatment.

The case I here report is not common and offers some points of considerable interest.

Male, *æt.* 17 years, was admitted to hospital in Professor Duret's service on November 22, 1918, for a chronic affection of the heel. Family antecedents devoid of interest. The patient was ill at the age of six with some thoracic affection, the nature of which he is unable to give, and was laid up for three months.

At his entrance to hospital, a physical examination did not reveal

any evidence of visceral, cutaneous or bone tuberculosis. The lungs, pleura and heart were normal, likewise the testicles and prostate. General physical condition good.

On April 6, 1918, the patient sprained (?) his ankle, but this did not prevent him from continuing his work for two days. On April 9, the pain became more intense, the foot swelled and the patient was obliged to quit work and an antiphlogistic treatment was applied. The patient was apyretic during all this phase of the illness, but on the other hand, he suffered from very sharp pain especially at night and principally during the onset of the trouble. He remained in bed for three consecutive months and during this time some redness developed over the external aspect of the region of the os calcis. After this an abscess formed and discharged. Some time later, the same thing occurred on the posterior surface of the region of the calcaneum. The general physical condition which at first was somewhat involved, returned to normal.

Examination on November 23. The upper surface of the foot was tumefied, red and painful. Over the region of the os calcis two small apertures were noted which gave issue to some droplets of badly mixed pus. The sinuses were quite ordinary and did not offer the rather characteristic aspect of tuberculous sinuses. Quite on the contrary to what usually takes place in the latter they opened on the internal aspect of the foot. By palpation the calcaneum was found enlarged in its posterior part and pressure was painful here. The anterior portion of the os calcis appeared to be healthy, likewise the bones of the tarsus. The joints of the instep and tarsus were not involved.

There was no rise of temperature and the general health was quite satisfactory. A diagnosis of prolonged chronic osteomyelitis of the posterior portion of the os calcis was made and I then made an attempt to discover how it might have occurred. The patient informed me that during all the month of March previously, which had been a particularly rainy month, he wore very old shoes with holes in them so that during this time his feet were exposed to both dampness and repeated traumatism, two important factors in the production of this morbid process. There was no history of a boil, erosions or other lesions of the integuments susceptible of giving entrance to the microbe into the organism and no history of sore

throat or lesion of the buccal mucosa contemporary with the onset of the bone symptoms could be obtained.

Operation, November 26.—A vertical incision was carried along the middle of the posterior aspect of the heel and continued for about three or four centimeters along the sole of the foot. The incision led directly down into a section of movable bone, this being the posterior portion of the os calcis which had become detached from the remainder of the bone. It was removed with great ease (see Fig. 1) after which the irregular cavity left was curetted and packed with iodoform gauze. Other than for a little gapping of the skin incision, recovery was uneventful and the patient was discharged two months later in excellent condition.

The treatment of all types of osteomyelitis is early surgery, the sooner the better. According to the case trepanation, sequestrotomy or subperiosteal partial or total excision will be required.

But before closing, I would like to briefly refer to the pathology of this interesting morbid process. The lesions caused by osteomyelitis of the calcaneum are quite the same as those met with in the long bones. When osteomyelitis involves the os calcis it generally confines itself to the apophysis of the bone. This is the area of osseous proliferation as well as the pathologic area, consequently it is here that the bacteria become fixed and set up an inflammatory process. This process does not involve singly the bone, marrow or periosteum but all the osseous structures at the same time. It consists essentially in proliferation of the osseous cells of the marrow and diapedesis of the white cells rapidly culminating in pus formation. In the first phase of the process, the marrow, enclosed in areolæ of spongy tissue, is hyperemic and red like that in childhood, then softens, becomes grayish in color and suppurates.

The pus formation is very rapid because in the acute cases there may be quite a large quantity formed within the space of forty-eight hours after the onset of the symptoms. On account of the resulting suppuration rarefying osteitis cavities form and fill with pus mixed with innumerable fat droplets derived from the medullary fat. If at this time a section be made of the calcaneum the spongy tissue will be found greenish, completely infiltrated and exuding small fat droplets.

At the same time an inflammatory process is taking place in the

osteogenitic layer of the periosteum. Between it and the bone a sort of inflammatory œdema develops which, in superacute cases, rapidly takes on a purulent aspect. The amount of pus may be so great that the periosteum is completely decorticated so that the entire bone is bathed in pus. From this it results that the os calcis becomes readily movable and can be easily removed at operation.

The pus is creamy, thick, reddish or more commonly greenish, and Ollier remarked that this green tint was peculiar to the pus in osteomyelitis of the os calcis.

As in the long bones, this inflammatory process may extend to the diarthodial cartilages there forming small erosions by way of which it can invade the neighboring bones and joints. Thus the calcaneo-astragalus joint is often filled with purulent synovial fluid, while the astragalus and cuboid offer changes in their cartilages. The joint surfaces are tumefied, soft and may develop fungous material.

This diffuse and extensive suppuration almost invariably produces sequestra which may attain the size of a large walnut or more. These sequestra represent the portions of the bone which have died; sometimes they are movable, as in the case reported, but more often they are invaginated by the production of new bone. The aspect of the sequestra varies according to whether the case is an acute or chronic process. In the former, the sequestrum undergoes little change on account of the rapidity of its development, its surface is smooth, and even, while its tissue does not differ from that of normal bone that has simply been macerated in water. On the contrary, when the process is prolonged and the sequestrum remains invaginated for a long time, its edges are eroded, and present a "gothic type" of structure, according to Mollière's happy simile.

When once the sequestra have formed they act as foreign bodies. If small they are eliminated by the sinuses, otherwise they remain where they develop, keeping up suppuration until they are removed by surgical interference. As soon as the process subsides in violence, another phenomenon develops; the cells that have proliferated build up exuberant bone tissue instead of making pus. This bony formation affects various arrangements; at times it produces new subperiosteal eccentric osseous strata which increase the size of the bone, at others osteophytes develop and invaginate the sequestrum, representing the beginning of repair and may be solid that the bony shell formed may

be sufficiently resistent so that it supports the pressure of the neighboring bones.

The inflammatory process in the calcaneum rarely presents the same intensity met with in the long bones and this is why there is abscess formation following osteomyelitis of the os calcis. The abscess, which is more or less large, is composed by a pyogenic membrane containing pus and at times one or several sequestra. Berger found several cavities in the os calcis of a young girl eighteen years old, lined with a pyogenic membrane which also lined the sinuses, while Paquet has recorded a case in which almost all of the anterior portion of the os calcis was free in a cavity lined with granulation tissue.

As lesions in the proximity of the process in the calcaneum, are to be noted purulent collections in the nearby joints and an infiltration of serous fluid and pus in the surrounding cellulo-fatty structures.

In the superacute forms of osteomyelitis of the calcaneum autopsy has revealed serious visceral complications. The pericardium has been found filled with seropurulent fluid, with loose adhesions. The pleura may also present recent adhesions and metastatic abscesses of small dimensions are found in the kidney.

As late complications tuberculosis must be mentioned. Ollier was very insistent on this later complication of osteomyelitis. In these circumstances the tuberculosis is confined to the parts where the osteomyelitis existed or at times it may develop in some other viscus. Finally, some cases have been recorded in which the lumen of the sinuses underwent epithelial degeneration.

REMARKS ON CERTAIN PATHOLOGIC PROCESSES OF THE TESTICLE

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I. ECTOPIA OF THE TESTICLE

When one goes over a large number of statistics derived from the most varied sources, it at once becomes evident that an ectopic testicle may migrate into its normal abode up to the ages of between fourteen and sixteen years and that after puberty if the glands have not achieved their migration the ectopia is to be considered permanent. It is also to be remarked that in a fairly large number of infants the descent of the testicles takes place after birth.

In reference to the varieties of undescended testicle, two conditions are to be considered. First, we have cases in which the testicle becomes arrested at some point of the normal route followed by it in its migration from the subrenal region to the fundus of the scrotum. Therefore, such cases can be properly called *arrested migration.* The second category of cases comprise all those instances where the testicle becomes engaged in some structure through which it should not normally enter or pass. These cases can be termed *defective migration.*

Cases of defective migration are, on the whole, excessively rare and certainly have become more and more so since infants no longer wear abdominal binders. This condition necessitates different operative technics indicated according to the anatomical characters offered by a given case and tax the ingenuity of the surgeon to the utmost.

Arrested migration usually occurs either at one of the openings of the inguinal canal or somewhere within the canal itself. This, then, is the inguinal variety of ectopia and is unquestionably the most frequently met with in practice and some surgeons with vast experience have never encountered any other type.

Generally speaking, an undescended testicle is smaller, softer and

paler than its fellow gland, while the sensibility is frequently dulled.

The structure of the organ varies considerably with the age of the patient, a fact which explains the diversity of opinion expressed by various writers, but it is more than probable that primarily the gland is structurally normal and it is only later on that it undergoes a fibrous and fatty transformation and finally atrophy. This late degeneration is yet another argument in favor of an early surgical interference, that is to say when the child is about eight or nine years old.

Every undescended testicle is physiologically sterile and incapable of secreting spermatozoa proper for fecundation, but the problem which is of interest to the surgeon is whether or not orchidopexia will result in awakening the functional activity of the compromised gland. This question has not been fully solved.

However, we do know that the testicle presides over two functions, namely, virility and fecundity. Now, the former is not always lost, because double cryptorchids possess genesic desire and in those instances where it was absent it has been known to return when the testicles have been placed in the scrotum. According to some writers this phenomenon is due to the functions of the interstitial gland which remain intact.

As to fecundity, considerable doubt exists and bilateral ectopia alone can enlighten us on this subject, but after operation the subject, having recovered his virility—if it had been lost—cares little for anything else and, consequently, is not apt to return to the surgeon to report upon his ability to procreate. Nevertheless, clinical data lead us to hope that an undescended testicle operated on in time may be capable of recuperating its function of spermatogenesis and I have notes of several cases of boys upon whom orchidopexia was done between the ages of nine and eleven years which I was able to follow three to five years and in them I found that the testicle increased in size, became harder and sensitive to pressure, showing that there was a tendency to evolution toward the normal type, although I would add that the operated testicle never attained the size of its normal fellow organ. On the other hand, there are unfortunately only too many cases in which operation has no influence whatever on the ultimate development of the testicle, the organ remaining congenitally changed in its structure.

Besides sterility, an undescended testicle is always subject to a

certain number of complications that I would briefly refer to. In the first place the organ is often painful and in its abnormal position is exposed to different sorts of trauma which are not without injurious effect. At the time of puberty, when it increases in size it becomes squeezed in the inguinal canal and this gives rise to *testicular colic.* The result is that the patient becomes nervous and irritable and some boys even become neurasthenic.

One of the most interesting complications of ectopic testicle is torsion of the cord, which I believe to be decidedly more common in this condition than in normal testicles. When torsion occurs, if operation is not resorted to at once, atrophy or necrosis of the gland ensues and its vitality forever compromised.

From its exposed position, an undescended testicle is prone to develop orchitis from trauma and the inflammatory process is more serious than in normally situated testicles for the reason that peritoneal complications may arise.

But of all the complications to be the most dreaded in undescended testicle, malignant transformation is unquestionably the most serious. Malignant change has a predilection for ectopic testicles and is all the more formidable because it occurs in the young subjects.

A word now as to those congenital malformations which frequently go hand in hand with inguinal ectopia of the testicle. Of the rather frequent concomitant affections, such as hydrocele, hypospadias or epispadias no reference need be made as they are developmental defects which in no way belong to the radical operation for the cure of the ectopia, but of inguinal hernia it is necessary to speak.

When an undescended testis exists the vagino-peritoneal canal will usually have undergone its evolution incompletely. A communication with the peritoneal cavity persists and the serous diverticulum is, in reality, a hernia sac. The ectopia is consequently accompanied by a hernia, but this rule is subject to many exceptions.

In spite of the ectopia, the vagino-peritoneal canal may become occluded, although this is not common, and in these circumstances it goes without saying that a hernia does not exist. In other cases the orifice of communication is very narrow and prevents the intestine from making its exit from the abdominal cavity, but sooner or later this will occur.

In the matter of pathogenesis of undescended testis we must admit

our ignorance although many theories have been offered, such as an arrested development or malformation of the testicular apparatus, premature occlusion of the vagino-peritoneal canal with the formation adhesions at the upper part of the latter around the internal ring. Some have thought that the external abdominal ring is occluded or its lumen too small to allow the testis to pass through. A short or abnormally developed external cremaster muscle has been supposed to be an etiological factor, likewise occlusion of the scrotal cavity from a fibrous septum.

Other surgeons have thought that in an uncomplicated case of undescended testis the condition is the outcome of peritoneal adhesions developed in the neighborhood of the internal inguinal ring, or on the hernia sac, if a hernia exists at the same time.

Now, all these so-called etiological factors have a very questionable pathogenic value. It is true that they exist and are encountered almost constantly at operation. All that can be said is that they are closely related to the congenital process and although it is an easy matter to say that they prevent the downward migration of the testis, it is just as logical to maintain that they developed because the gland did not descend.

Whatever may be the reality of the facts, what is to be remembered is that these defects are usually present in ectopic testis, that they offer a great obstacle to the artificial descent of the gland and that one of them—a short cord, fortunately infrequent—has been the principal cause of unsuccessful operative results.

Of the operation *per se,* little need be said. When a testis is found at the internal ring or in the inguinal canal it is just as well to operate when the child is a couple of years old and not to wait until he has reached the age of eight or nine, although personally I have generally preferred waiting so that the anatomical structures may have developed and from my own experience I do not think that the testicle suffers by this delay.

The most generally applicable and satisfactory technic is that of Bevan with which you are all familiar.

II. SYPHILITIC FUNGUS OF THE TESTICLE

With the tremendous advance made in the diagnosis and treatment of syphilis in the past fifteen years, it rarely happens that the modern

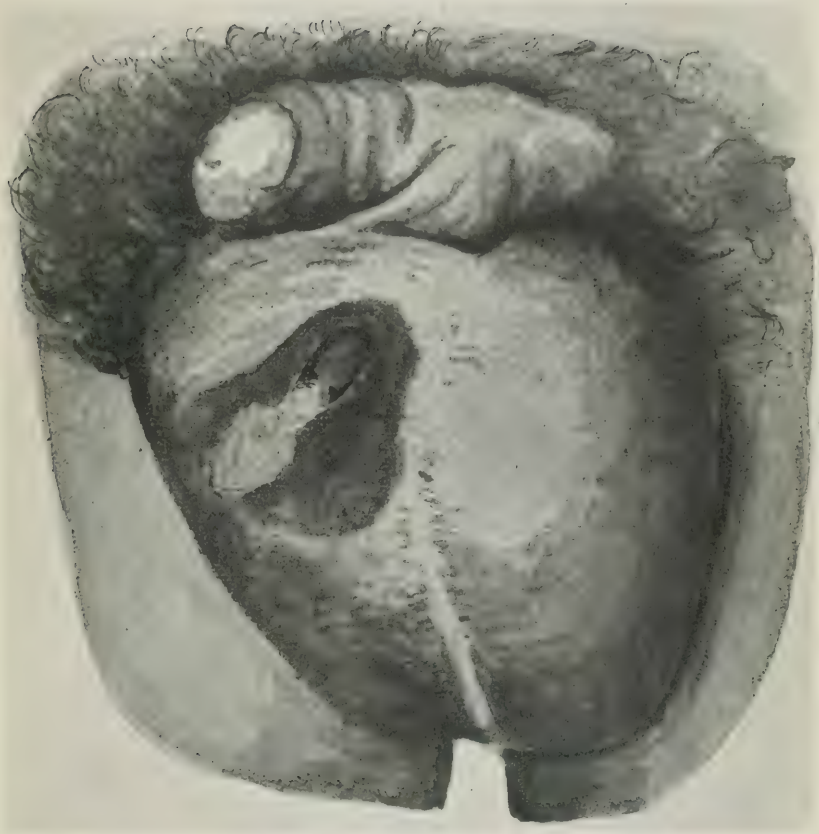
surgeon encounters advanced cases of tertiary syphilis of the testis which have been neglected to such an extent as to have arrived at the phases of necrosis and fungus formation, but as such a possibility may nevertheless confront one when least expected, I desire to call your attention to this pathologic process.

By fungus of the testis I mean a reddish granulating mass, forming a hernia through the ulcerated scrotal envelopes. The essential mechanism of the process is as follows: A gumma of the albuginea or parenchyma of the testicle has, during its successive developmental "drives," if I may be allowed this technical expression of warfare, produced the formation of adhesions between the seminal gland and its envelopes. The later finally develop an inflammatory process and ulcerate and when this has occurred one or two conditions are offered to the clinician. Either the entire testicle or a portion of it surrounded by its albuginea escapes by the opening in the scrotum, in which case a *superficial fungus* has developed, or the seminal gland remains in its cavity, the albuginea and the integuments break down and give exit to the softened caseous mass. Fibrous trabeculæ of the testicle or of the encysting membrane of the gumma develop granulation tissue whose exhuberant growth at first fills the small cavity, and then forcing their way through the cutaneous opening become strangulated and spread over the surface of the scrotum in the form of a fungous mass. This is the second variety, or *deep fungus.* (See Figs. 1, 2, 3.)

The extreme form of superficial fungus is that where the testicle and its granulating albuginea form the hernia. But a superficial fungus may exist, although the testicle does not protrude outside of the scrotum. In this circumstance the gumma in the albuginea is eliminated through a less extensive necrotic opening, and afterward the deeper layers of the membrane give rise to granulation tissue which, after protruding through the opening in the scrotum, spread over its external surface. The external laminæ of the albuginea are destroyed but the testicle does not protrude and appears to be intact, so superficial are the lesions.

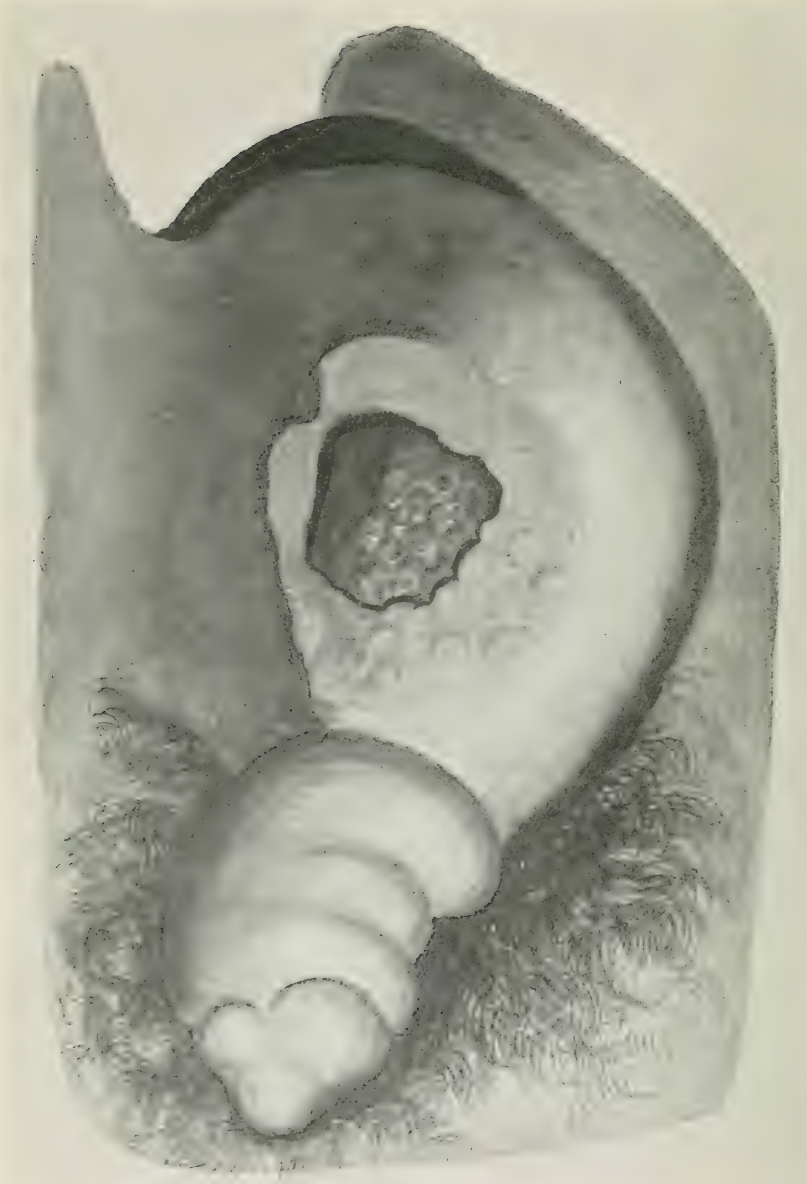
The deep or parenchymatous fungus is derived from the midst of the testis. In this case the albuginea is broken down, likewise the scrotum, so it is through this loss of tissue that the granulations pass to spread over the surface of the scrotum. The mechanism of the

Fig. 1.



A suppurating sclero-gumma of the right testicle. The left side of the scrotum is enlarged and contains an indurated, lumpy indolent testicle. The right scrotum is ulcerated and at the bottom of the crater formed by the loss of necrotic tissue is seen a softened yellowish mass. With dressing forceps a substance similar to the core of a boil can be withdrawn. The right testicle is also lumpy, indolent and hard (Reclus).

Fig. 2



Syphilitic fungus of testicle. This was a deep-seated process and on the anterior lateral aspect of the left scrotum, whose insegument is œdematous and covered with granulation tissue, is a loss of tissue through which a granular mass, the size of a large hazel-nut, protrudes. The fungous mass comes from the midst of the parenchyma of the testicle. Under antiluetic treatment the process rapidly cleared up, leaving a testicle about the size of a cherry-stone attached to the spermatic cord (Reclus).

Fig. 3.

A superficial syphilitic fungus of the testicle. The right scrotum is distended by an enormous sclero-gummatous testicle. The envelops of the left scrotum are partially destroyed and this extensive loss of tissue has given exit to about two thirds of the seminal gland. The albuginea, which is exposed, is covered with exuberant granulation tissue (Reclus).

process is simple. A gumma of the testis is expelled, and the evacuation being completed the fibrous tissue is exposed. It proliferates and the resulting mass of granulation tissue, after filling the cavity, escapes outside the scrotum and a so-called fungus results. Should total infiltration take place, the entire testicle will become necrotic and is emptied through the scrotum in the form of a puriform substance. In this case the granulations forming the fungus arise from the internal surface of the remains of the albuginea.

III. LYMPHADENOMA OF THE TESTICLE

Mr. Russel Howard,[1] writing on malignant disease of the testicles, says: "It usually occurs in one testis, but French writers have described a special variety which has a tendency to attack both testes at the same time." This special variety is called lymphadenoma by the French although it is in reality a lymphosarcoma and I would refer briefly to its clinical aspects.

A lymphadenoma of the testicle usually has a silent onset and frequently the patient's attention is only directed to his testicle on account of increase in size, which soon becomes inconvenient from its weight. The development of the neoplasm is ordinarily rather slow and it is only exceptionally that it acquires considerable size in a few months time. When the growth has attained notable dimensions it distends the scrotum although no other change occurs. In a few reported cases some ectasis of the scrotal veins has been observed.

By palpation, the organ is found enlarged but retains its shape. Its surface is regular, occasionally slightly bosselated; its consistency is elastic, sometimes hard, but it is uniform throughout the gland. Palpation is not painful and, as in syphilitic orchitis, the testicle loses almost completely its special sensibility to pressure. The epididymis can rarely be palpated because it is flattened and spread over the surface of the testicle.

In most cases the spermatic cord is uninvolved although it may be increased in size from ectasis of the veins.

This symptomatology offers nothing very special and in the enumeration of the clinical characters of the affection we find none which allows one to make the precise diagnosis. All these characters are to be found in syphilitic orchitis, congenital growths and sarcomata

[1] *A System of Surgery.* Edited by C. C. Choyce, vol. ii, p. 942. London, 1914.

and carcinomata of the testis. However, there are two other symptoms to which I have purposely not referred which have an unquestionable value from the viewpoint of differential diagnosis, namely, the occurrence of the process in both testes and neoplastic metastases in various regions of the body.

Monod and Terrillon[2] insist on the frequency of the bilateralism of the disease and point out that out of the five cases they mention, in four both testes were involved at the same time or at a very short interval and these writers, in their excellent study on lymphadenoma of the testicle, come to the conclusion that this variety of neoplasm is about the only one that involves both seminal glands.

A second and equally important character in the differential diagnosis is the development of metastases in divers parts of the body. The metastases may arise very early in the evolution of the process, even almost at the onset of the testicular lesion, but as a general rule they occur late in the disease when the neoplasm of the testicle has been present for some time.

Whether the neoplasm of the testicle is operated on or not, these patients die from metastases. The inguinal, iliac and mesenteric lymph-nodes become involved, even the intestine and gall-bladder may not remain free from them, while the bones of the cranium, vertebræ and sternum likewise have been known to have become involved.

One other symptom to which I would refer are the blood changes in lymphadenoma of the testicle. There is a decrease in the red-corpuscle count. In Guyon's case it was 2,967,000; in Trelat's the erythrocytes numbered 3,360,000 and four months later 3,200,000.

On the other hand, the white cell count is increased in some cases, but this is far from being the rule. This is not surprising because it is known that in lymphadenoma of the lymph-nodes there is not usually a leucæmia.

To the above-mentioned symptoms may be added certain negative signs which are certainly not devoid of value in the diagnosis. These are especially evident during the first phase of the process and consist in an absence of enlarged inguinal and iliac lymph-nodes, an intact prostate and seminal vesicles and a good state of general health for a considerable lapse of time. In most instances the health does not decline until a generalization of the neoplasm has taken place.

[2] "Traité des Maladies der Testicule," p. 654, Paris, 1889.

As I have already said, the evolution of the neoplasm under consideration is rather slow, usually requiring several years before the patient applies to the surgeon for treatment. For the sake of convenience the clinical evolution may be divided into two phases, the first being that of a simple enlargement of the testes, giving rise to no symptoms.

The patient's attention is only attracted by the painless increase in size of his scrotum, until at length this becomes so considerable that he seeks medical advice.

In the second phase, that of generalization and cachexia, the clinical picture changes. The testicles, which up to this time were slowly increasing in size, rapidly augment in volume, and being both involved means malignancy. Palpation of the iliac fossæ and abdomen reveals the presence of masses of lymph-nodes, while metastases in other parts of the body, particularly in the subcutaneous tissue of the face and neck, are only too evident. The cachexia of malignant disease appears with constipation, sometimes diarrhœa, while vomiting is not uncommon. Cough is frequent and then dyspnœa appears, indicating a pleuro-pulmonary metastasis. The urine becomes scanty and contains albumin, while the appearance of œdema of the lower limbs announces the coming death, the usual end in lymphadenoma of the testes.

The differential diagnosis of this neoplasm is a very delicate matter, particularly at the onset. A tumor slowly distending the scrotum appears without any painful phenomena and without involving the general health. The tumor is renitent, sometimes hard, its surface regular. It is impossible to feel the epididymis which appears to be lost in the neoplastic mass. The cord is normal or very slightly enlarged, while rectal examination is negative.

Given this condition of affairs, several hypotheses come to the mind of the clinician; either the tumor has developed in the vaginalis or it is growing in the testicle itself. In the first case a confusion with hematocele is alone possible. When an hematocele offers its classic characters in the form of a medium-sized, smooth, piriform, elastic tumor, with the testicle pushed to the back of the scrotum, when, in addition, its rigid walls offer a crepitus like new leather, no doubt can subsist as to the diagnosis of a pachyvaginalitis, especially when the tumor has grown in sudden and successive exacerbations in size with-

out involving the general health. But each of these signs may be wanting, so that the diagnosis becomes well nigh impossible. Nevertheless, when any doubt exists it is, in my opinion, better to look upon the case as a malignant tumor and then one will be on the safe side.

If the growth has developed in the testicle itself, syphilis is first to be thought of. It must not be forgotten that syphilitic orchitis has a firmer consistency, that it is less painful on pressure and that its surface is riddled with small, rounded, hard nodules due to an albuginitis. The testicle is flattened and has the shape of a pebble.

As to the diagnostic value of Wassermann's reaction in these cases, I agree entirely with Harrison when he says:[3] "In the diagnosis of syphilitic affection of the testicle and epididymis a positive Wassermann reaction would be evidence for the syphilitic nature of the lesion, but naturally not conclusive, since the reaction might be due to syphilis elsewhere. A negative reaction would support a diagnosis of some non-syphilitic condition."

As to confusion with other neoplasms of the testicle, it is yet more likely and it is indeed difficult to clinically differentiate a lymphadenoma from a sarcoma, carcinoma or a teratoma. However, when I gave the principal characters of lymphadenoma I insisted on the semeiological value of four symptoms, which when combined leave little doubt as to the probable nature of the neoplasm, but it is not necessary to repeat them here.

IV. EPITHELIAL NEOPLASMS OF THE TESTICLE

Epithelial tumors of the testis may be either pure or complex. The pure type of epithelial neoplasm is either atypical or typical. The atypical tumors form the group which the classic text-books place under the heading of carcinomata of the testicle, of which there are two types, namely, the hard type or scirrhus, and the soft or encephaloid.

The typical tumors are of two sorts: (a) Those which develop from the Wolffian body or mesonephros and are termed *Wolffian epithelioma;* and (b) those which develop from the unemployed seminiferous tubules and are called *seminiferous epithelioma.*

The Wolffian epitheliomata include a considerable portion of

[3] "The Diagnosis and Treatment of Venereal Diseases in General Practice," p. 65, 2nd ed., London, 1919.

those tumors which the text-books describe under the title of "cystic disease" of the testis. The seminiferous epitheliomata at times assume the gross microscopic and histologic aspect of sarcoma, at others that of carcinoma.

All these epithelial growths of the testicle are explained by ontogenesis, and from the more general viewpoint of the study of the development of neoplasms in the testicle three types of cell centres can be distinguished, which the evolution may awaken into activity at any time.

This much having been said of the pathology of epithelial neoplasms of the testicle, I would say a few words as to the functional symptoms and evolution of neoplasms of this organ, leaving aside the physical signs.

Between a scirrhus and an encephaloid the difference in the rapidity of volution is great and for this reason in scirrhus the lymphatic network is less largely opened and the mesenchymatous sclerosis abundant, while in encephaloid the inverse holds, from which we may conclude that the evolution of a scirrhus will be relatively slow, that of encephaloid rapid. Other than this the entire clinical study is the same in both varieties.

The onset is usually silent. Often it is a concomitant hydrocele or testicular pain extending to the lumbar or inguinal region that first attracts the patient's attention. Then the scrotum changes its aspect, the testicle loses its physical attributes, becomes larger or appears to be undergoing atrophy. At this time the scrotal envelopes will be found either intact or ulcerated.

If intact, a more or less considerable tumefaction of one of the bursæ will be observed and the subcutaneous venous network will be usually well marked. The neoplasm will be found to be testicular and frequently both the epididymis and the origin of the vas deferens will be included in the mass. The tumor is adherent to the superficial structures over a considerable extent.

At this time in the evolution the inguinal lymph-nodes may be still intact, but the lumbar chain is considerably enlarged. In certain cases the lymphatic metastasis takes place very early in the evolution, even when there is little to be found in the testicle, and manifests itself by phenomena of compression: Ascites, œdema of the lower limbs, compression of the sciatic nerve and the collateral branches of

the sacral plexus, resulting in neuralgia and more or less serious neuritis.

When once ulceration of the scrotum has taken place we have what the older writers described as a malignant fungus. This is a granulating, fungous, putrid mass, having the characters of a neoplastic ulceration. Then the inguinal lymph-nodes become involved, the phenomena of iliac and lumbar compression increase in intensity, and the patient thus begins to make his way more or less rapidly to cachexia and dies in from two to four years in the case of encephaloid and from eight to fifteen years in scirrhus. Death, which is often the result of visceral or lymphatic complications, may also result from secondary infection.

The onset of a Wolffian epithelioma is likewise silent and slow; the only functional signs being pain and a feeling of weight in the groin. But soon the cysts increase in size and number, the scrotum becomes distended and the tumefaction then arrives at such a degree as to be inconvenient to the patient.

Up to this time in the evolution of the process the inguinal lymph-nodes will have remained intact and so they may continue to remain in some cases, and when this occurs the Wolffian epithelioma behaves clinically like an adenoma. Langhaus, Kocher and other writers describe this type under the name of cystic adenoma.

But sometimes the proliferation assumes a greater activity, the tubules rupture in the stroma of the neoplasm, the typical epithelioma then becomes atypical and transforms into carcinoma, as the older writers would say, or continues its evolution as we would say at present.

From the brief remarks that I made on the pathogenesis two types of seminiferous epithelioma should be described, one belonging to sarcoma, the other to certain forms of carcinoma of the testicle. But the number of histologic examinations are as yet too few to enable one to even outline a clinical picture. Therefore I shall be content to say that in every case where a neoplasm of the testicle having the clinical aspect and consistency of a sarcoma, but which does not appear to undego an evolution having the great rapidity belonging to this variety of malignant growth, the diagnosis of a seminiferous epithelioma should be seriously considered. Likewise, this diagnosis is to be taken into consideration in cases where a carcinoma, with a more or less con-

siderable involvement of the lymph-nodes, has been clinically diagnosed, but with a testicle only slightly increased in size and offering a tumor appearing to arise in the neighborhood of Highmore's body. In these circumstances a portion of the testicle still retains its normal consistency and shape.

The complications of epithelial new growths of the testicle consist particularly of metastases in the lymph-nodes, lesions of the vaginalis testis and involvement of the scrotal structures.

The involvement of the scrotal structures results in the formation of malignant fungus, the ulcer having all the characters of a neoplastic ulcerative process, namely, covered with rather gross granulations of a yellowish or grayish tint giving off a bloody secretion with a very foul odor and offering blackish or yellowish hemorrhagic spots, with sometimes plaques of necrobiosis. Around the ulcer the skin is thickened and rugose and intimately united to the underlying tumor of the testicle.

The lesions of the vaginalis give rise to a sero-purulent or hemorrhage secretion—sometimes blackish or brownish—which fills the cavity of the vaginalis.

The lymph-node metastases occur first in the pelvis and lumbar region, but they may occur throughout the lymphatic system. If the subcutaneous lymphatics become involved they invade the integuments, producing secondary malignant ulcerations.

As to the prognosis, there are epithelial neoplasms malignant from their onset, rapidly involving the lymphatics; their prognosis is bad. There are spermatic epithelial growths which remain latent for a long time, later on sending off their cell elements into the testicular parenchyma. At the onset they are simple adenomata, but finally become epitheliomata. They, therefore, have two phases from the viewpoint of prognosis; the first relatively benign—that of an adenoma; the second malignant quite as much so as a carcinoma.

Finally, epithelial new growths of Wolffian origin may remain benign or become infecting from the neoplastic veiwpoint according to their evolution and as much so as carcinomata. In other words, excepting the very rare cases and always during a small part of their development epithelial growths are malignant, always making the ultimate prognosis very dark.

I am perfectly well aware that Ewing looks upon all testicular neoplasms as teratomata, but for the time being, at least, it would be difficult for me to accept this teaching, even from so eminent an authority on neoplasms.

V. THE CHOICE OF OPERATION IN MALIGNANT DISEASES OF THE TESTICLE

The last subject that I desire to discuss in a few words is the selection of the operation for malignant disease of the testicle and the contraindications for interfering surgically.

It is unquestionable that, given the present state of the question, it is absolutely impossible to decisively pronounce upon the respective advantages of simple castration or castration followed by a systematic removal of the aortic and lumbar lymph-nodes.

In point of fact, castration is a very antique procedure, which counts a number of undeniable cures, due probably to the fact that the lymph-nodes had not become infected at the time the testicle was removed. On the other hand, it is frequently followed by a recurrence which results in death after a varying lapse of time.

Castration followed by extirpation of the lymph-nodes, in principle more rational and in conformity with the laws of general pathology, is a technic yet too recent for one to be able to estimate the exact value of its results with any degree of certainty. This interference allows the surgeon to explore the lymph-nodes at the iliac bifurcation and aortico-lumbar area, to judge their condition where otherwise clinical investigation would remain powerless. By resorting to it one may be lucky enough to find that only the first lymphatic group has become involved, as has occurred in some cases, and therefore be in time to interfere radically.

But just as recurrence occurs after castration, removal of the deep-seated lymph-nodes, which is not an operation devoid of danger, will be a useless operation when an error in diagnosis has been made or when the lymphatic metastasis has reached such a degree as to be unoperable, a condition which cannot be foreseen, or when the lymph-nodes cannot be removed, either because they are seated behind the aorta or above the renal vessels or finally because they escape the surgeon's notice.

The problem is, consequently, very intricate and its solution

extremely difficult. To decide the question, what is lacking, is the exact notion of the time at which the neoplastic emboli emigrate into the lymph-nodes. Before this has taken place castration will be quite sufficient, but afterwards it becomes both necessary and indispensable to complete castration by a systematic removal of the lymphatics.

But it is an acquired fact that either one of these operations will certainly radically cure a certain number of testicular malignant new growths so that it is legitimate surgery to operate on cancer of the testicle when the surgeon can offer some guaranty of cure by submitting, with a minimum of risk, to operative acts which the gravity of the patient's condition allows.

Now, let us see what the three most recent American and English text-books on surgery have to say.

Russel Howard[4] says: "The modern treatment of malignant disease of the testis is removal of half the scrotum containing the diseased testis, the spermatic cord, the spermatic vessels as high up as possible, and the cellular tissue containing the lymphatic glands lying along the external and common iliac arteries and aorta as high as the renal vessels. This complete extensive operation is at present only possible in a limited number of cases and is contraindicated if the lumbar glands are clinically enlarged."

E. O. Smith[5] writing on the subject says: "Early removal of the tumor including the spermatic cord is the only treatment to be recommended and this does not ensure a favorable prognosis. Recurrence within the abdomen usually follows very soon after the removal of sarcoma of the testicle, death ensuing within a few weeks or months at most." He makes no reference to removal of the aortic and iliac lymph-nodes and, although he does not say so, probably employs the technic that I devised in 1903 (*American Medicine,* 1903, p. 607) and which is given in full by Binnie in his "Operative Surgery."

Warbass (*Surgical Treatment,* vol. iii, Philadelphia, 1919, p. 306) states that "tumors of the testicle should be treated as tumors in other parts....in carcinoma of the testicle the postperitoneal lymphatics should be dissected out if the patient is to be given the best chance of recovery."

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[4] "The Practice of Surgery," p. 1208, 2nd ed., London, 1918.

[5] "Treatise on Regional Surgery," edited by Binnie, p. 552, vol. ii, London, 1917.

From the above three quotations, which I have selected at random, it is evident that much divergence of opinion still persists in the minds of operators generally, but I would add that the reason for the many unsuccessful results following castration and removal of the cord as is done in my operation is unquestionably due to the fact that patients come to the surgeon too late, their case usually having been treated by their physician as a "swollen testicle."

Is it clinically possible or possible by histologic examination to appreciate the gravity and to formulate the precise indications for either of these two interferences? It would seem to me that if the neoplastic propagation within the scrotum be studied such a possibility may be foreseen. I am of the opinion that when there is a manifest infiltration of the spermatic cord, whether the case be a seminoma or mixed growth, a systematic dissection of the lymphatics is formally indicated because they will certainly be involved. Out of a total of forty-three cases of castration in which the cord was infiltrated the patients were known to have either died or had had a recurrence with the exception of seven, four of these seven have been lost sight of and three were recovering from removal of the subperitoneal lymph-nodes at the time Mascarenhas made this report.

When the spermatic cord is normal, two conditions are to be considered. In mixed neoplasms, given the frequency of embolus, dissection of the lymph-nodes should follow castration. Nevertheless, mixed tumors strictly localized to the testis, without any reaction in the vaginalis, have been radically cured by simple castration in 23 per cent. of the cases. In these circumstances it is evident that the surgeon may well hesitate as to the necessity of doing a more radical operation.[6]

In seminomata localized in the testis, with or without involvement of the epididymis, with or without vaginalis, involvement of the lymph-nodes is far from being constant. Castration gives the appreciable figure of 33 per cent. cures.

Castration is a benign and simple operation and should be preferred to the more radical procedure providing, of course, that the cord

[6] These and the following percentages have been taken from Mascarenhas, "Theses," Paris, 1912.

is removed according to my technic. Although dissection of the lymphatics is susceptible of giving a large percentage of radical cures it would appear that in these particular cases the patient is exposed to an undue risk, inasmuch as the operation may be of necessity incomplete or even impossible to carry through when the lymph-node mass proves to be inextricable.

When the spermatic cord is not infiltrated and if dissection of the lymph-nodes is decided upon, the castration should first be done and the removal of the lymph-nodes undertaken a few days later. During this delay a careful and complete histologic examination of the testis can be made, which is naturally of the highest importance.

The contraindications are the advanced condition of the testicular neoplasm, a profound involvement of the general health and an advanced degree of lymphatic metastasis.

The supraclavicular lymph-nodes should be palpated and, if found enlarged, indicate that the thoracic duct is involved, and any pulmonary manifestations must be taken into serious consideration as they probably indicate metastases in the lungs.

Progress of Medicine
For the Year 1921

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DIABETES

Joslin (*Jour. Am. Med. Asso.*, 76: 79, 1921) states that the death rate from diabetes, according to statistics, has greatly increased in the past thirty years, and believes that there are probably more than a half million diabetics in the United States at the present time. In a thousand cases he found no patients who were 31 or more per cent. below normal weight, but two hundred and seventy-three who were 30 or more per cent. above normal. There were only five who showed a maximum weight 21 or more per cent. below normal, while there were three hundred and ninety-four whose weight was 21 or more per cent. above. So, in his series, when the persons were 21 or more per cent. overweight diabetes occurred seventy-nine times as frequently as when they were correspondingly underweight. Diabetes, therefore, according to Joslin, is a penalty of obesity.

He points out that obesity is predominant in certain other factors that are often mentioned in the etiology, such as the Jewish race, richer classes of society, heredity, mental workers, and the fifth and sixth decades of life. So he looks upon overweight as the important predisposing factor, and believes that one-half the cases can be prevented by maintaining an average normal weight. He urges that physicians educate their patients to this point of view and finally makes a plea for early diagnosis by routine examination of the urine for sugar.

Gastronuovo (*Riforma Medica*, 63: 927, 1920) has been impressed with the fact that over 50 per cent. of his diabetics give a history of chronic or latent infections, especially malaria, tuberculosis, and syphilis. He ascribes its great prevalence in southern Italy to malaria and tuberculosis. These, he believes, damage the

liver and pancreas and so predispose. Padilla and Paz (*Revista de la Asoc. Med. Argentina,* 33: 383, 1920) report 6 cases which they believe developed on a syphilitic basis. The glycosuria disappeared in all of them under anti-syphilitic treatment. They approve in addition, of course, of the usual dietetic management. On the other hand, Lemann (*Am. Jour. Med. Sc.,* 162: 226, 1921) does not find the incidence of diabetes among the negroes of the south greater than it is among the whites, in spite of the marked syphilization of the former, and concludes that there is no etiologic relationship.

In discussing the influence of the extremes of age Allen (*Am. Jour. Phys.,* 54: 425, 1921) suggests that childhood infections injuring the pancreas may account for some cases later in life. Blodgett (*Penna. Med. Jour.,* 24: 407, 1921) reports 4 cases of acute diabetes, which he believes were due to pancreatic infection secondary to infection of the tonsils. One showed a reappearance of sugar and a lowered carbohydrate tolerance following each of three attacks of sore throat. In another instance the patient was steadily improving when tonsillitis developed and immediately the blood sugar and urine sugar increased.

Diez (*Policlinico,* 28: 431, 1921) cites statistics showing trauma as a factor in etiology, the percentages ranging from 2 to 10. He especially points out the influence of trauma on the development of gangrene in diabetics and warns against occupations exposing them to accidents. Landis (Asso. of Am. Phys., reported in *J. A. M. A.,* 76: 1606, 1921) calls attention to the hereditary and familial tendency referring to five diabetic children, all brunettes, in a family of nine; the other four, blondes, had no glycosuria.

In regard to treatment Newburgh and Marsh (*Arch. Int. Med.,* 26: 647, 1920) raise an objection to the customary high protein diet, claiming that patients do not remain sugar free on it unless the energy intake is kept so low that incapacity from starvation results. They point out the value of a high fat, low protein, and low carbohydrate diet, such a diet keeping the patient sugar-free, preventing the occurrence of severe acidosis, maintaining the nitrogen balance, and making it possible for him to resume the ordinary activities of life.

In a second paper (*Arch. Int. Med.,* 27: 699, 1921) they present the records of blood sugar readings in forty-five diabetics, in forty of whom there occurred a satisfactory response to the high fat

diet with only sufficient protein to maintain the nitrogen equilibrium and a minimal amount of carbohydrate. Their standard diet consisted of 100 to 250 gm. of fat with 15 to 50 gm. of protein and 10 to 15 gm. of carbohydrate. On this diet the blood sugar fell in most instances to normal and no acidosis occurred.

Woodyatt (*Arch. Int. Med.,* 28: 125, 1921) offers an explanation for a certain type of glycosuria that develops with prolonged undernutrition. He believes that such a patient catabolizes so much endogenous protein that the resultant glucose exceeds his tolerance. He therefore proposes that the total metabolism, including the breaking up of body tissues, must be taken into consideration in each case, and not merely the ingested carbohydrate, fat, and protein. So long as there is plenty of fatty tissue or fat in the diet the proteins of the body are to an extent spared, but in the absence of fat these are broken down and yield 58 per cent. glucose. He emphasizes the desirability of considering the diet in simple terms of glucose and fatty acids and states that the relation between these should not exceed one to one and a half.

Williams (*Am. Jour. Med. Science,* 162: 62, 1921) in an evaluation of the Allen method of treatment, basing his study on 206 cases with glycosuria, 106 of whom were clearly diabetic, concludes that it is a distinct clinical advance. While permanent cures are not obtained, nevertheless patients for a considerable time are much benefited. In young people the expectance of life is doubled, whereas older subjects, without complications and when faithful to treatment, can probably survive the normal life expectancy. The treatment is of greatest value when instituted early in the disease. Most failures are due either to serious complications or to unfaithfulness on the part of the patient.

Mason (*Canadian Med. Asso. Jour.,* 10: 1105, 1920) reports on 153 cases treated essentially according to the Allen method. After rendering the patient sugar-free he supplies, if the blood sugar permits, 30 calories per kilogram of body weight, keeping the patient in nitrogen equilibrium. On discharge each patient, in addition to his gram scale, measuring graduate, and urinalysis equipment, is supplied with a printed weekly report sheet. The latter he has found most helpful in following his cases.

Allen and Wishart (*Am. Jour. Med. Science,* 161: 165, 1921)

would limit exercise in diabetics to the requirements of comfort and hygiene. They discourage the practice of heavy exercise, advocated by the earlier clinicians for burning up surplus sugar, but emphasize the hygienic benefits of light exercise.

There has recently been a tendency to discourage the use of alkali, especially sodium bicarbonate, in diabetic acidosis, but Carey (*J. A. M. A.*, 76: 1393, 1921) reports two cases of severe acid intoxication with extreme alkali deficits in which massive doses of sodium bicarbonate were followed by striking clinical improvement. He does not recommend its unrestricted use but in cases of precoma with a low reserve of alkali the symptoms of acid intoxication can be promptly eliminated by immediate recourse to alkali. He prefers to give it by mouth and considers it important to get 25 to 50 gm. into the body in the first two hours. The reaction of the urine should be carefully watched.

Leune (*Deutsch. med. Woch.*, 47: 867, 1921) states that we should not aim to eliminate glycosuria under all circumstances. Often we must be content if the diseased organism will perform its functions reasonably well so as to improve the patient's condition subjectively and objectively, even though the glycosuria persists. Many patients feel better on a more liberal diet with slight glycosuria. He also points out that some patients assimilate one carbohydrate better and some another. Oatmeal will be found good for some and bad for others. When the capacity for improvement in assimilation has been lost, then further limitation in proteins and the introduction of fast days are indicated. If after such measures a better assimilation of carbohydrates does not occur it is a bad sign.

Fitz (*Arch. Int. Med.*, 27: 305, 1921) discusses the relation of hyperthyroidism to diabetes but finds no evidence that the coincidence of these two conditions is anything more than chance. When associated the diabetes tends to parallel in severity the severity of the thyroid intoxication. The patients in his series with non-toxic goitre who were operated on showed no improvement of the diabetes. On the other hand, certain patients with toxic thyroid disease improve to a considerable degree after the thyroid symptoms are checked. This, he believes, occurs mainly as a result of the change in the rate of metabolism.

THYROID DISTURBANCES

Physiological Hyperthyroidism.—In a very readable contribution Brooks (*Endocrinology,* 5: 177, 1921) discusses what he calls physiological hyperthyroidism, by which he refers to the normal response of the thyroid gland to certain natural stimuli. Many of the characteristics of youth, he claims, are really manifestations of thyroid activity. The alert, aggressive attitude of the healthy young man and the similar, though feminized, pose of the healthy young woman are in large part evidences of thyroid activity. The more charming the young woman, the more virile and attractive the youth, the more constantly will it be found that a large thyroid gland is present. The same is true of the young artist or actor or writer or poet when his artistic perceptions are most keen. Periods of great emotional output, such as courtship, early months of marriage, and the more active phases of an artistic career are accompanied by temporary enlargement of this gland. It is particularly noticed in pregnant women, perhaps partly because of the demands incident to the building of new fetal tissue. He refers to the madonnas of the great masters as showing this. He also calls attention to the enlargement sometimes seen with menstruation. Thus he points out that under certain more or less normal conditions symptoms of thyroid disturbance appear and says that these symptoms are often interpreted as indicating serious and permanent disease, whereas treatment on that basis may result in harm. Indeed, incorrect management of such cases often leads to true exophthalmic goitre, neurasthenia, or eventual nervous and physical inadequacy.

Goitre Prevalence.—Levin (*Arch. Int. Med.,* 27: 421, 1921) found 1146 goitres among 1783 unselected persons in Houghton County, Lake Superior region of Michigan. These included 682 simple goitres, 420 adenomas and cystomas, and 44 colloid goitres. He shows that the incidence curve increases in both sexes during puberty, and then drops slightly as growth is attained. For the female it remains up for the child bearing period, going a little higher for the menopause, while for the male it drops gradually until 35 or 40 years of age when there is a slight rise. The simple goitres maintain the average up to 35 years of age and then the adenomas and

cystomas maintain it. No explanation for the high incidence of goitre is given, but it is noted that the water supply was varied, this being a point against the infection theory.

In a region in which goitre is endemic, says Schlesinger (*Zeitschr. f. Kinderheilk.,* 27: 207, 1921) the new-born often show transient thyroid hyperplasia which subsides in a few months. A second wave sets in at the age of 6 or 7 in girls and of 9 in boys reaching its height at about puberty. The growth and development of these children is in advance of their years, both physically and mentally, and curvature of the spine and myopia are more common in them.

At the University of Wisconsin 28 per cent. of 13,706 entering students had simple thyroid enlargement and 6 per cent. had exophthalmic goitre. The ratio of males to females was 1 to 2.

The prevalence of goitre in certain parts of Mexico, up to 20 or 25 per cent. of the population in the state of Guerrero, is reported by Nájero (*Rev. Méx. de Biología,* 1: 47, 1921). The states on the west coast and Vera Cruz have zones with 8 to 10 per cent. of the population affected. In the Urubama district of Peru the goitres are said to be of unusually large size, with a tendency toward the exophthalmic type, and about 2 per cent. of the population in certain districts are cretins (*Monge, Crónica Méd.,* 38: 3, 1921).

From a study of 1308 cases of goitre admitted to the public hospitals at Lausanne over a period of thirty years Boitel (*Revue Méd. de la Suisse Romande,* 40: 717, 1920) finds that this condition is more prevalent in the plains and valleys than in the mountain districts. Heredity was manifest in 47 per cent. of the cases. The old residents did not seem to be more or less affected than the comparative newcomers. His research failed to show that lack of iodine in the air was an etiologic factor.

Etiology.—Schmidt (*Mitt. a. d. Grenzgeb. d Med. u. Chir.,* 33: 512, 1921) rejects all the current theories as to the cause of exophthalmic goitre and declares that it is due to the thyroid secretion being changed in some way which increases its power of dispersion. As a result of this dispersion the follicles are injured and regenerative proliferation of epithelium follows. In hyperthyroidism the secretion is an unfinished product but it exerts a toxic action; in exophthalmic goitre, on the other hand, it is an overdeveloped, overripe substance.

Adenoma with Hyperthyroidism.—Boothby (*Endocrinology,* 5 : 1, 1921) discusses adenoma of the thyroid with hyperthyroidism, distinguishing this from exophthalmic goitre. In the latter the hyperthyroidism, according to Plummer, is associated with diffuse hypertrophy and hyperplasia of the gland, while in the former it is associated only with an adenoma in the gland. The syndrome associated with hyperthyroidism from adenoma is, Boothby believes, a distinct clinical entity. It is characterized by an increased metabolic rate excited by an excess of normal thyroid hormone in the tissues. Seventy-seven per cent. of his cases were more than 40 years of age when they came for examination and had had a goitre without symptoms for an average of 19 years. The average age was 47.6 years, while the average for exophthalmic cases was 33 to 38 years. The average duration of the tumor in the exophthalmic cases was only 1 to 3 years. The duration of symptoms was longer for the adenoma cases, 2 to 2.2 years as against 1.3 to 1.7 years for the exophthalmic cases. The systolic blood-pressure was distinctly higher in the adenoma with hyperthyroidism cases, as was also the diastolic pressure. In 75 cases of adenoma with hyperthyroidism the average basal metabolic rate before treatment was +35 per cent. and after operation +7 per cent. In a group of 36 exophthalmic cases the rate was +66 per cent. before treatment and after ligations, three months rest at home, and thyroidectomy it dropped to +19 per cent.

Substernal Goitres.—Pemberton (*Arch. of Surg.,* 2: 1, 1921) reports that of 4006 patients thyroidectomized in the Mayo Clinic 542 (13.5 per cent.) were found to have glands situated substernally, and 25 of them (0.6 per cent.) were classified as intrathoracic. In 72 there were no symptoms other than the presence of a tumor. In 128 there was associated hyperthyroidism. Tracheal deformity was noted in 30 per cent., dilated veins in the neck and on the chest wall in 10.7 per cent. Although hoarseness was complained of by only 29 patients 45 showed paralysis of one or both vocal cords.

Glycosuria in Goitre.—The glycosuria sometimes observed in cases of exophthalmic goitre is due, according to Holst (*Acta Medica Scandinavica,* 55 : 302, 1921), to the relationship between the thyroid gland and the pancreas. He reports eight cases showing glycosuria, three of which he looked upon as a combination of diabetes and goitre.

In nine cases of exophthalmic goitre on record the pancreas was found pathologic. He advises röntgen ray treatment of the thyroid in the combination cases, saying that reducing the thyroid function will release its inhibiting action on the function of the pancreas.

It may be this relationship between the thyroid and pancreas that explains and gives significance to the alimentary hyperglycemia test. Morris (*J. A. M. A.*, 76: 1566, 1921) believes this test to be of value in making the diagnosis of mild hyperthyroidism. In a study of ten such cases he found the blood sugar curve highest after one and a half to two and a half hours, instead of at the end of one hour as in the normal, and he also found the maximum blood sugar to be notably higher in the thyroid cases. He admits that the test is not pathognomonic. Roussy and Cornil (*Bull. Méd.*, 34: 1057, 1921) say of this test that a negative reaction is decisive against toxic goitre. Sainton, Schulman, and Bezançon (*Presse Méd.*, 29: 735, 1921), studying in a like manner a series of fifteen cases, got negative results and concluded that there was no basis for the assumption of a thyroid diabetes. When any tendency to hyperglycemia or glycosuria is found they believe some other factor must be at work.

Myocardial Necrosis in Hyperthyroidism.—Goodpasture (*J. A. M. A.*, 76: 1545, 1921) reports two cases of hyperthyroidism with myocardial necrosis. This is rare and he inclines to the view that the necrosis is due to an injurious agency other than that responsible for the underlying cardiac disease, the myocardium having a greater susceptibility to injury than normal.

Prophylaxis of Goitre.—Marine and Kimball (*J. A. M. A.*, 77: 1068, 1921) make a further report upon their extensive and intensely interesting prophylactic work against goitre among the children of Akron, Ohio. Under the term of simple goitre they include all those thyroid enlargements in man and animals formerly grouped as endemic, epidemic, sporadic, and physiolgic, but exclude exophthalmic goitre. Although the ultimate cause of simple goitre is still unknown they claim that the immediate cause is a lack of iodine. The enlargement may result, therefore, from any factor which increases the iodine needs of the organism, as infection, or which interferes with the normal utilization of iodine. They have found that any salt of iodine completely protects the remaining thyroid against com-

pensatory hyperplasia (the normal reaction to lack of iodine) even after the removal of three-fourths of the gland in cats, dogs, rabbits, rats, and fowls. A milligram of iodine, given at weekly intervals, has prevented thyroid hyperplasia in pups.

They first made use of these facts in the prevention of goitre on a large scale in 1909 and 1910 when they found that the addition of iodine to water containing brook trout prevented the development of endemic goitre in the trout. The prevention of human goitre was first tried in 1917 when the authors began work with the school children of Akron. The method consisted in the administration of 2 gm. of sodium iodide in 0.2 gm. doses, distributed over a period of two weeks, and repeated each autumn and spring. Their results after two and a half years were as follows: Of 2190 schoolgirls taking the iodide twice a year, as outlined above, only 5 developed enlargement of the thyroid, while of 2305 not taking the prophylactic 495 developed thyroid enlargement. Of 1182 pupils with thyroid enlargement at the first examination who took the prophylactic, 773 thyroids have decreased in size; while of 1048 similar cases not taking the prophylactic, only 145 decreased in size. Klinger, they say, has recently reported even more striking curative results in the school children of the Zürich district. In 760 children he found 90 per cent. goitrous at the first examination and only 28.3 per cent. of 643 of them after fifteen months.

They consider the risk of producing iodism or exophthalmic goitre by their treatment slight, and believe that such cases as have been reported were due to excessive amounts of the drug. In cases of the exophthalmic variety they recommend milligram doses of iodine and that the patient be observed daily.

Finally they point out that the prevention of goitre means the prevention of those forms of cretinism, mutism and iodisy which are dependent on thyroid insufficiency, of thyroid adenomas, whose growth once initiated is frequently not controlled by iodine, and of the terminal metamorphoses, including most of the malignant thyroid tumors.

As an inexpensive, routine and popular prophylactic Sloan (*Ohio State Med. Jour.*, 17: 172, 1921) suggests the use of iodized table salt in those regions which are goitrous. The concentration of the iodine need not be more than 1 in 5000.

Treatment.—As a treatment for goitre with hyperthyroidism

Couland (*Bull. Méd.*, 34: 1066, 1921) warns against the use of either iodine or arsenic, as the gland is already rich in both of these elements. He has been impressed with the action of ovarian substance, which seems to relieve the thyroid of much of the extra work. He thinks that insufficiency of the ovaries is at the base of almost all of the syndromes of hyperthyroidism.

Röntgen ray therapy gives good results in the acute cases of exophthalmic goitre says Belot (*Bull. Méd.*, 34: 1063, 1921), and he advises against operation in these cases until it has been tried. With simple toxic goitre, neoplasms, and cystic goitre with symptoms of intoxication, however, he considers that it is often powerless and sometimes contraindicated. Schulte (*Nederlandsch Tijdschr. v. Geneesk.*, 1: 1243, 1921) points out that röntgen ray treatment renders operation more difficult, that fatalities have been reported, and that exophthalmic goitre has been transformed into myxedema by this means. Hermann-Johnson (*Arch. of Radiol. and Electroth.*, 26: 20, 1921) looks upon it only as a *via media* between unsuccessful medical treatment and surgery, and not as an alternative to surgery. He admits, however, that its early employment will tend greatly to reduce the number of cases in which operation need be considered. Gaarenstroom (*Nederlandsch Tijdschr. v. Geneesk.*, 1: 209, 1921) tried it in four cancerous thyroid cases and in three the goitre retrogressed, one man of 41 and one of 60 having been free of symptoms at the time of his report for one and a half years, and one had been free of disturbance for six months. The other had metastases and succumbed. A cure may be counted on, he says, if there is no metastasis.

Surgery still holds its own and will continue to hold it against röntgenotherapy in the treatment of exophthalmic goitre, says Liek (*Deutsche Zeitschr. f. Chirurg.*, 166: 144, 1921), who compares a series of 100 operative cases in his private practice with 100 similar cases recently reported by Nordentoft and Blume in which the röntgen ray was used. The ultimate results, he claims, are all in favor of surgery, and only when this fails should röntgen exposures be considered. In that case the thymus and ovaries should also be rayed.

Radium implantations into the thyroid of bad risk cases of exophthalmic goitre has been tried by Terry (*J. A. M. A.*, 76: 1821, 1921) who reports that in eleven such cases four were sufficiently

improved to undergo partial lobectomies (one of these died) and the other seven showed improvement. He does not believe it will supplant ligations but that it offers less risk.

PERNICIOUS ANÆMIA

Etiology.—Although most instances of pernicious anæmia occur in middle life, Mensi (*Pediatria,* 28: 785, 1920) reviews 29 cases in the young, 14 of which were in infants, all of the total being boys except 9. The anæmia was in most of the cases of the aplastic type and the etiology was obscure. Litchfield (*Med. Jour. of Australia,* 1: 231, 1921) reports a case in a boy, aged two years and three months. Eason (*Edinburgh Med. Jour.,* 25: 389, 1920) states that until the age of 50 the rate of incidence inclines to be higher in the female than in the male and that thereafter it is definitely higher in the male. He believes that senility is a more important etiologic factor than has hitherto been recognized, finding the largest number of cases in the Edinburgh hospitals between 45 and 59 years of age, and the rate per 100,000 of the population was highest between 55 and 69. This point is made also by Curschmann (*München. Med. Wchnschr.,* 68: 172, 1921) who, in an examination of the records of the Rostock Medical Clinic from 1914 to 1920, showed that there were no less than 13 cases between 61 and 78. Not infrequently the condition is disguised under the form of senile cachexia and cardiac insufficiency. He recommends that every case of senile glossodynia should have the blood examined for pernicious anæmia. He believes that long remissions can be obtained by energetic arsenic treatment.

Meulengracht (*Hospitalstidende,* 64: 263, 1921) refers to five cases, only one his own, in which during life or at necropsy, a stricture was found at one or more points in the bowel. The strictures were apparently the result of old healed tuberculous ulcers. He suggests that the absorption of toxins from the bowel above the stricture may have caused the anæmia. In support of this assumption he refers to the cases which develop in the pregnant, in subjects with tape worm and gastric achylia. Maynard and Sturton (*Brit. Med. Jour.,* 2: 685, 1921) report a similar case in which a definite ring of ulcers was found in the intestine. Krag-Möller (*Acta Medica Scandinavica,* 53: 860, 1921) believes that there is a causal relation

between intestinal tuberculosis and pernicious anæmia but that this is due to a resorption of hemolytic toxins produced by the tuberculous process. Biffis (*Policlinico,* 28: 877, 1921) found that in 5 of his 7 women patients the anæmia had developed in connection with pregnancy. Levine and Ladd (*Johns Hopkins Hosp. Bull.,* 32: 254, 1921), in a clinical study of 143 consecutive cases, found a family history of pernicious anæmia in some other member of the family in nine instances and in two others there was a history of death from an unknown type of anæmia. They found the disease less frequent in Italians, Russian Jews, and immigrants from eastern Europe, than in Americans, Canadians, or immigrants from Ireland, England, Sweden, or Denmark. Syphilis did not seem to be an etiologic factor; even when the Wassermann was positive anti-syphilitic treatment did not alter the course of the anæmia.

Symptoms and Diagnosis.—The neurological symptoms that occur in pernicious anæmia are emphasized by Hamilton and Nixon (*Arch. of Neurology and Psychiatry,* 6: 1, 1921) who claim that nervous system changes occur in 70 to 80 per cent. of the cases. Subjective disturbances constitute the earliest and most frequent evidence of such involvement, and are often the first indication of the disease. The most characteristic neurological evidences are: (1) The relatively greater loss of deep as compared with superficial sensibility, and (2) the subjective sensory disturbances. There is a distinct lack of parallelism between the severity of the blood and the nervous phenomena, and either may precede the other by a long period of time. Marked remissions in the blood picture may be accompanied by only slight or no changes in the nervous disturbances. Degenerative changes in the peripheral nerves are common and have to do with the production of the sensory disturbances; they are especially important in those cases in which marked remissions of sensory phenomena occur.

Schneider (*Southern Med. Jour.,* 14: 442, 1921) claims that in 80 per cent. of all cases there will appear sooner or later one or more of the following neurological findings: (1) Loss of vibration sense in the distal ends of the long bones of the limbs, (2) loss of position sense, or joint sense, with or without loss of vibration sense, (3) loss of tactile sense to cotton-wool in fingers and toes, and (4) motor disturbances, often ataxic, with loss of the deep reflexes. Ballman (*Med. Klin.,* 17: 249, 1921) reports four cases in which the symptoms

of spinal disease occurred at a very early stage of the disease and so dominated the clinical picture that a disease of the blood was not at first suspected. He recommends that on the occurrence of spinal symptoms, the significance of which is not absolutely clear, a careful blood examination be made.

In all but one of Biffis' (*Policlinico,* 28: 877, 1921) 30 cases an achylia gastrica was present, in 50 per cent. the motor function of the stomach was exaggerated, and diarrhœa was frequent but never severe (due to the achylia). Gastric anacidity received special attention in Levine and Ladd's (*Johns Hopkins Hosp. Bull.,* 32: 254, 1921) clinical study. Out of 107 cases given an Ewald test meal only three showed any free hydrochloric acid and in two of these the diagnosis was questioned. Pepsin was found absent in the cases in which it was tested for. Out of their total of 143 patients, fifty-four showed 5 per cent. or more of eosinophilia at one time or another. In 76.9 per cent. of their cases the blood smear was typical of the disease, in 18.2 per cent. it was suggestive, and in 4.9 per cent. it was atypical or normal. In 63.8 per cent. the tongue was typically smooth and atrophic, and in 19.7 per cent. it was suggestive. They claim that in these cases the hair turns gray prematurely, taking on a strikingly silky white appearance.

Brandes (*Med. Klin.,* 17: 189, 1921) reports four cases in which gastric carcinoma was found post mortem and in which it could not be determined which was primary. In two of the cases the pernicious anæmia seemed to be responsible for the cancer.

Treatment.—It is generally agreed that no treatment to date has actually cured pernicious anæmia but long remissions have been realized in many hopeless cases under various treatments. Giffin and Szlapka (*J. A. M. A.,* 76: 290, 1921) in reporting upon fifty cases that were splenectomized at the Mayo Clinic more than three years ago conclude that this operation should be recommended when, in view of all circumstances, personal as well as medical, the possibility of the prolongation of life appeals to the family and to the patient, and that occasionally the operation may be performed in order to bring about an immediate remission. Their operative mortality was 6 per cent., and 21 per cent. of those who recovered from the operation survived three years or longer, and 10 per cent. for more than four and a half years. An immediate remission occurred constantly and

in 20 per cent. of the cases they believe life was prolonged by the operation. The more marked immediate improvement occurs in those in whom there is evidence of active hemolysis. Garke (*Deutsche Arch. f. klin. Med.*, 136: 143, 1921) points out its uselessness in the aplastic type of anæmia.

Rieux (*Médicine*, 2: 456, 1921) considers that the finest results to date have been with the transfusion of blood and when this has been associated with splenectomy improvement has occurred in 50 per cent. of the cases. Bowdich (*Johns Hopkins Hosp. Bull.*, 32: 83, 1921), however, points out that in certain patients who have been transfused repeatedly tranfusion becomes self limited because of the inadequacy of selecting suitable donors, that this difficulty having once been discovered no attempt should be made to transfuse further, and that the severe reaction is probably due to an anaphylactic manifestation, and not to hemolysis *per se*.

The efficacy of repeated subcutaneous injections of whole blood in small amounts is referred to by Waag (*Münch. med. Wochenschr.*, 68: 677, 1921). He states that Pappenheim recommends the method because it is simple, conservative and free from severe febrile sequels, and that Carnot interprets the improvement that follows as due to an increased erythropoiesis of the bone marrow. In a patient with an extreme degree of anæmia (Hb. 25 per cent. and 285,000 red cells) he claims to have brought the hemoglobin up to 55 per cent. and the red cells to 2,600,000 in four weeks by nine injections of 5 c. c. each, given bi-weekly. During this time the patient gained 13 pounds in weight.

Diet and rest are still considered the essential factors of importance in the cure of the pernicious anæmia patient by Hurwitz (*California State Jour. of Med.*, 19: 275, 1921). He considers iron and arsenic of secondary importance. The transfusion of blood gives remarkable symptomatic relief and in some it helps to bring on a remission but it does not prolong a spontaneous remission, nor does it lengthen the average duration of life. Splenectomy, he believes, prolongs life in only about one fifth of the patients.

Weber (*Med. Klin.*, 17: 253, 1921) records several cases treated by colloid iron solution combined with arsenic. He found this combination effective when the iron alone had not been. On the other hand, Whipple and Robscheit (*Arch. Int. Med.*, 27: 591, 1921), as

the result of a careful study of the effect of iron and arsenic in the anæmia of hemorrhage under experimental conditions, find no or very little evidence of their efficiency. They consider the meat factors in the diet of far greater value. It is to be noted that this work involved only the anæmia of simple hemorrhage in animals, and it may not be applicable to human disease. Sonne (*Hospitalstidende,* 63: 713, 1921) refers to a patient of 38 with a severe anæmia and achylia who was not benefited by arsenic or organic iron preparations, but who showed marked benefit from inorganic ferrous sulphate and reduced iron.

LEUKÆMIA

Acute leukæmia, a fairly uncommon disease, may occur at all ages, though it has a special predilection for childhood and adolescence, says Sabrazès (*Gaz. hebd. d. sc. Méd. de Bordeaux,* 42: 109, 1921, abstracted in *Med. Science,* 5: 8, 1921). It is most frequent in the male sex. Various pathological conditions, especially infections, figure in the history, such as rickets, chronic enteritis, hemorrhages, septicæmia, puerperal infection, typhoid fever, scarlatina, tonsillitis, tuberculosis, malaria, syphilis, and influenza. The outstanding physical findings resemble those of chronic leukæmia but the course is more rapid, the tendency to hemorrhages often more marked, the fever high, and the asthenia profound. It may be mistaken for septicæmia, typhoid fever, dysentery, acute rheumatism, or acute nephritis. Sometimes it is complicated by areas of gangrene and so resembles noma. Also it sometimes simulates acute meningitis due to meningeal hemorrhages and sometimes urticaria pigmentosa owing to the leukæmic skin lesions. The measures applicable to chronic leukæmia, such as radium, röntgen rays, arsenic and benzol, are inoperative or actually harmful in the acute variety of the disease.

Smith (*Am. Jour. Dis. Child.,* 21: 163, 1921) reports a case unlike any one previously recorded that occurred in an infant of 6 weeks who had an axillary gland palpable at birth, suggesting the possibility of intrauterine development. There were purpuric spots and a spleen that filled two-thirds of the abdomen. The liver and the lymph glands were enlarged. Before death at two months from pneumonia the leucocytes numbered 30,000, 32 per cent. being large lymphocytes. The mother's blood picture was normal.

A patient with the myelogenous variety of acute leukæmia, having only 7600 leucocytes but 47 per cent. of myelocytes and myeloblasts, is reported by Maynard (*J. A. M. A.*, 76: 238, 1921). Coyon and Lavedan (*Bull. de la Société des Hôp.*, 45: 196, 1921), on the other hand, report a case that had a leucocytosis of 720,000, embryonal forms predominating. A case of acute leukæmia in pregnancy is recorded by Wallgren (*Acta Medica Scandinavica*, 54: 133, 1921), the woman dying 25 days after delivery of a macerated but non-leukæmic infant. Of the three such cases found in the literature one gave birth to a child that lived. Valero (*Siglio Medico*, 68: 429, 1921) reports a case of the hemorrhagic, pseudoscorbutic type that began with violent epigastric pain, vomiting, signs of infectious purpura, infarctions in the cervical glands and the spleen, and pains in the limbs. The leucocytes dropped from 80,000 to 2100 and the patient died on the sixtieth day. Proliferation of the malpighian corpuscles in the spleen in a case of acute myeloid leukæmia is reported by Villela and Torres (*Brazil-Medico*, 1: 327, 1921) and they believe this to be the first such case recorded.

Harris (*Lancet*, 1: 122, 1921) describes symmetrical polyneuritis as an early finding in a case of chronic lymphatic leukæmia, this being present before the blood picture was positive. Skin lesions are fairly common findings, especially petechiæ in the late stages. Blankenhorn and Goldblatt (*J. A. M. A.*, 76: 583, 1921) describe a case without the characteristic blood changes but with striking skin lesions all over the body, these being of various kinds and shapes, from miliary points to patches 5 cm. in diameter, hemorrhagic, slightly elevated and firm. Some were scaly, others were covered with a creamy pus. The membranes of the mouth and conjunctivæ showed the same type of lesions, but here secondary infection was more marked. Evidence obtained from examination of one of the lesions at biopsy was inconclusive but the post-mortem showed the typical lesions of leukæmia, there being leukæmic infiltration, lymphatic type, of skin, heart, right lung, kidneys, pancreas, liver, and lymph-nodes. The left lung contained an abscess and this may have accounted for the low leucocyte count. Martinotti (*Tumori*, 8: 63, 1921) discusses the cutaneous manifestations, referring in his article to the chronic hyperplastic ones. Sahlgren (*Hygiea*, 83: 321, 1921) reports a case of what he calls leukæmic lymphadenosis, running a two

year course in a previously healthy man of 49. There was enormous enlargement of the lymph glands, especially in the neck, chin, and groin with œdema and patches of infiltration. Aubertin and Giroux (*Presse Méd.,* 29: 314, 1921) reported a case of questionable leukæmia which resembles those recently described by Stillman and by Giffin. In all three cases the eosinophile percentage amounted to 85 to 91, and in all the spleen was enlarged.

Treatment.—During the last ten years Rénon and Degrais (*Bull. Acad. de Méd.,* 85: 207, 1921) have treated eight leukæmic patients by radium application to the splenic area. The immediate effects were good though the patients died at periods varying from two months to six and a half years. The spleen diminished in size from day to day and finally resumed its normal size. The leucocytes fell gradually to normal and sometimes lower, the myelocytes disappeared, and the red cells increased. The general condition improved, the fever subsided, and the weight increased. The cure, however, was only apparent, for in from two to eighteen months the signs of the disease reappeared. Reapplications of the radium had very little effect. The writers believe the relapse is due to progressive resistance of the myelocytes to the radium. They advise less frequent irradiations in the future but very intense ones. The same authors (*Bull. de la Société des Hôp.,* 44: 1511, 1921) tell of a woman who had been given several series of radium exposures passing through a normal pregnancy, the child now being 5 years old and healthy. Three series of exposures over the spleen had been made during the pregnancy. The woman died one year after the childbirth. Kosmach (*Am. Jour of Obstet. and Gyn.,* 1: 485, 1921) reports two well-developed and subsequently fatal cases associated with pregnancy. He refers to ten similar cases in the literature. All but one were of the splenomedullary type. In most instances the mother survived only a short time and one of his two cases died before delivery. In most cases the infants were born alive but in some death occurred in from a few days to five months after labor. Kosmach does not approve of allowing pregnancy to occur in such patients. He recommends that no röntgen ray treatment be given until after labor is induced because of its bad effect on the fœtus.

Schisler and Brown (*Med. Record,* 99: 505, 1921) discuss in detail the effect of röntgen rays and benzol separately and combined

on the blood picture in a case of chronic myeloid leukæmia. The neutrophilic myelocytes showed a gradual steady fall under benzol with a corresponding increase in the polymorphonuclears relatively. On discontinuing benzol, a distinct and marked absolute increase occurred but was controlled with repeated doses of röntgen rays. The röntgen rays had less effect on reducing the myelocytes than the lymphocytes and polymorphonuclears.

SPLENIC ANÆMIA

Garin (*Rivista Critica de Clinica Medica,* 22: 1, 1921) describes with necropsy findings a case of Banti's disease which he, in consultation with Banti himself, had under observation for eleven years. The patient, a man, was 67 years old. He does not believe that syphilis, tuberculosis, or alcoholism was a factor in this case, although acute miliary tuberculosis was responsible for the patient's death. The testimony seems to favor some primary infection localizing in the spleen and permanently injuring its structure and function. The toxins generated in the faulty metabolism of the spleen further injure the spleen itself and also other organs connected with its circulation, particularly the liver. Cirrhosis of the liver occurred early in this case although ascites did not develop until after nine years. There was no hemorrhage and even at the tenth year there were 3,500,000 erythrocytes and 40 per cent. hemoglobin. The patient refused splenectomy, and was treated with arsenic and a few röntgen ray exposures.

Hallez (*Nourrisson,* 9: 24, 1921), reporting two cases personally observed, says that while the immediate cause is still a mystery it is known that the disease may subside under treatment for syphilis, malaria, or other suspected factor. General hygiene with iron and arsenic may prove helpful, and improvement has followed röntgen ray exposures over the spleen.

Moynihan (*Brit. Med. Jour.,* 1: 114, 1921) has had five patients with splenic anæmia referred to him for gastric or duodenal ulcer. The absence of a clear history of dyspepsia, the palpable spleen, and the blood changes soon settled the diagnosis. The only treatment, he says, is splenectomy, and he stresses the importance of choosing the proper moment for the operation. After a large hemorrhage or when the spleen is very large it should not be done. In the latter case

radium should be used to reduce the spleen and before it has begun to enlarge again, as it will do after a few weeks, the splenectomy should be performed. The average mortality is 10 per cent., but for the later stages only it is 25 per cent.

Cancelli (*Pediatrica,* 29: 832, 1921) reports what he believes to have been a case of Banti's disease in a child of eight months, the Wassermann test being positive in both mother and child. He tabulates for comparison 9 other cases in children from nine weeks to six years old, 10 between seven and fourteen, and 12 between fifteen and seventeen years. Recovery is recorded in 7 and improvement in 5 after splenectomy. All but one finally succumbed. Syphilis was suspected in 9 cases and tuberculosis in 2.

Sweetser (*Surg., Gynecol., and Obst.,* 33: 376, 1921) analyses forty-two cases of third-stage Banti's disease in which splenectomy was performed and reports a case of his own in which fifteen months after the operation the man, aged 37, was in perfect health, but in whom a relative lymphocytosis had recurred, the normal relationship of neutrophils to lymphocytes being even more markedly disturbed than prior to splenectomy.

Pallin (*Upsala Läkareförenüngs Förhandlingar,* 26: 1921) records a case with jaundice and digestive disturbances (not usual features) for two years, the removed spleen suggesting a second-stage Banti's disease. After the splenectomy, the jaundice, the anæmia, and the leucopenia disappeared but the digestive disturbances persisted.

POLYCYTHÆMIA

A case of polycythæmia vera, with a red cell count of 6,740,000 and a hemoglobin of 140 (Sahli), is reported as occurring in a woman of 59 by Gitlow (*Med. Record,* 99: 227, 1921). Dizziness and giddiness, easy fatiquability, neuralgic pains, and an increasing ruddiness of the face were the chief symptoms. She occasionally had colicky pains in the epigastrium and vomited bloody mucus. Her nose and gums bled at times.

In a patient reported by Richards and Herrmann (*Minnesota Med.,* 4: 161, 1921) all the subjective symptoms disappeared after the removal of 500 c. c. of blood from a vein, and the red cell count dropped two million and the hemoglobin from 115 to 96.

Böttner (*Deutsche med. Wchnschr.,* 47: 773, 1921) reports the

case of a patient with a hemoglobin of 145 and a red cell count of 9,800,000 who was completely cured by two series of röntgen ray treatments. In a year and a half there has been no relapse. In two other patients his results were not so good.

Rydgaard (*Hospitalstidende,* 64: 379, 1921) also reports a case which cleared up after röntgen ray exposures to the spleen and without a recurrence during the eighteen months that followed. Pendergras (*Am. Jour. Med. Sc.,* 161: 723, 1921) reports a case having a red cell count of 6 to 10,000,000 which received röntgen ray treatment over a period of five years, only the splenic area being treated the first two years and later the bones. No beneficial effect was noted until the treatment was directed to the bones. Then the erythrocytes dropped, in the course of two years, from 8,250,000 to 5,680,000, but subsequently they rose again.

AURICULAR FIBRILLATION.

Effect of Quinidin.—In 1914 Wenkebach reported two cases of auricular fibrillation in which the normal rhythm was restored temporarily by quinin and in 1918 Frey, studying the effect of various cinchona derivatives on this type of cardiac arhythmia, found that quinidin had this action to the most marked degree. By its (quinidin sulphate) use in ten cases he secured a normal sinus rhythm in six. During the three following years, according to Levy (*J. A. M. A.,* 76: 1289, 1921), reports of one hundred and one cases of fibrillation so treated appeared in the foreign literature, in 58.4 per cent. of which the normal rhythm resulted. The duration of this happy result, however, was short, a few days to four months. The usual dose was 0.4 gm. by mouth three times a day. Auricular flutter has been noted as the transitory mechanism in some instances. The mode of action has not been certainly determined though last year Hoffmann (*Ztschr. f. Biol.,* 71: 47, 1920), as the result of work on dogs, suggested that it was due to a diminution in the excitability of the auricular muscle to electrical stimulation. At the time of Levy's report only four patients had been treated in this way at the Rockefeller Institute. In two of them a normal rhythm was restored; in the third one transient auricular flutter developed followed by a return of fibrillation; and in the fourth there occurred only a temporary increase in heart rate without alteration of mechanism. From this limited experience he

was inclined to advise that the doses be given at more frequent intervals than had been previously recommended.

During the course of the year numerous other articles on this fascinating subject have appeared in the literature, most of them bearing out in the main the original claims of Frey. The disappointing feature is that the results do not seem permanent. In the percentage of favorable results Jenny's (*Schweizerische med. Wochenschr.,* 51: 272, 1921) experience surpasses that of all others, he securing a normal rhythm in seventeen of eighteen fibrillation cases, whereas Frey (*Deutsche Archiv. f. klin. Med.,* 136: 70, 1921) is able to report success in only 42 per cent. of 50 cases. Jenny used from 0.5 to 15.5 gm. to accomplish his results, using 0.5 gm. two or three times a day. He says 2 to 3 gm. a day need not be feared, but at the slightest sign of derangement of vision or hearing the drug should be stopped. Faber (*Urgeskrift for Læger,* 83: 577, 1921) says success can be counted upon in 66 per cent. of these cases. Frey points out that lost compensation should first be restored with digitalis, if possible, and that a dilated heart cannot be brought back to normal, or only transiently. Recent cases, particularly those of nervous origin, he says, are suitable for this treatment. Cheinisse (*Presse. Méd.,* 29: 426, 1921), after reviewing twelve French and German articles, is quite pessimistic as to the ultimate effect of the drug. Boden and Neukirch (*Deutsche Archiv. f. klin. Med.,* 186: 181, 1921) found its action uncertain in total arhythmia, but had constant success in treating extra-systolic and paroxysmal tachycardia. Bock (*Medizinische. Klinik,* 17: 1052, 1921) reports two cases in which the effect had persisted for a year. He regards acute and recurrent endocarditis as contraindications. Arnell (*Hygiea,* 83: 529, 1921), in spite of getting satisfactory results in only four of nine cases, regards the use of this drug as almost the only promising progress in the treatment of heart disease for twenty years. Drury and Iliescu (*Brit. Med. Jour.,* 2: 511, 1921) got good results in six of thirteen cases, the others showing only a temporary retardation of the auricular rate.

This slowing of the auricular rate Lewis, Drury, Iliescu, and Wedd (*Brit. Med. Jour.,* 2: 514, 1921) regard as the essential feature of the drug's action. They consider that it has a paralysing action on the vagi and that by reducing vagal tone it increases the

power of the junctional tissues to conduct. But opposed to this, they state it has a direct action on the junctional tissues.

Arrillaga, Guglielmetti, and Waldrop (*Rev. de la Asoc. Med. Argentina,* 34: 454, 1921) maintain that in addition to its inhibitory action on the vagus nerve, it has a sedative action on the myocardium, reducing the excitability of the latter to a point below that at which fibrillation is possible.

Hewlett and Sweeney (*J. A. M. A.,* 77: 1793, 1921) point out certain dangers in its use and maintain that in some cases it has an unfavorable influence on compensation. They believe it should be given only after decompensation has been treated by other measures, after an exact diagnosis has been made, and when the patient is kept under careful observation. Combinations of quinidin and digitalis should probably be avoided. Hamburger (*J. A. M. A.,* 77: 1797, 1921) and Oppenheimer and Mann (*J. A. M. A.,* 77: 1800, 1921) present additional articles on the subject, citing cases and drawing conclusions in the main similar to those stated above.

Wolferth (*Am. Jour. Med. Sc.,* 162: 812, 1921) has contributed the most exhaustive and satisfactory article yet to appear in English on this subject, reporting twelve cases in which the drug was tried. In seven of these the normal rhythm was restored. Including Levy's four cases and one hundred and forty-seven from various European sources he states that the normal rhythm has been restored in 51.5 per cent. of 163 cases. His review of the literature on the pharmacologic action of the drug leaves one in doubt as to exactly how its effects are produced, but it seems that quinidin is a depressant to the heart influencing chiefly the functions of contractility, excitability, and conductivity.

In three of his cases the results were excellent. In one the fibrillation was easily abolished and at the time of publication the rhythm had remained normal for over two months and there had been striking clinical improvement. In another, which had been somewhat improved by digitalis, there was a further distinct improvement after the restoration of normal rhythm by quinidin. During the subsequent three months under observation there was a steady improvement in cardiac strength. The third case showed after one day's treatment a drop in the ventricular rate from 150 to 88 with a coincident return to normal rhythm. Two patients, in whom the

normal rhythm was not restored, said they felt better, but there were only two others in the entire series who secured subjective relief. In no case did alarming symptoms develop, though there were some complaints of weakness, dizziness, epigastric distress, and ringing in the ears.

Wolferth points out that the most favorable cases for treatment are those with (1) relatively good heart muscle and at least fair compensation, and (2) flutter or fibrillation that has been present only a short time. He states that this form of therapy is still in the experimental stage and emphasizes that close observation should be maintained, the patient being in a hospital or under the care of a well-trained nurse.

DISEASES OF THE KIDNEY

Importance of Albumin and Casts in the Urine.—In a study of 5200 persons who were rejected for life insurance over a period of ten years because of persistent albumin or albumin and casts in the urine Dublin (*Am. Jour. Hygiene,* 1: 301, 1921) found that their death rate was distinctly higher than normal. For those (2073) who showed albumin on several occasions the mortality was 183 per cent. of that which might have been expected in a group of insured at the same ages who were presumably free from serious defects. For those (3264) with both albumin and casts the mortality rate was high for virtually every important cause of death. The rate for cancer was twice as high as normal, for diabetes and tuberculosis each three times as high, for apoplexy and cerebral hemorrhage and for organic heart disease four times as high, while for Bright's disease it was twelve times as high. The gravity of the impairment seemed to vary directly with the amount of albumin. The presence of casts added to the gravity of the impairment, especially granular ones.

Albuminuria was found in all of ten ski runners after a racing match, tube casts in 80 per cent. of them, and erythrocytes in the urine in 30 per cent. by Frenkel-Tissot (*Zeitschr. f. klin. Med.,* 90: 54, 1921). He believes this albuminuria to be a physical phenomenon, like fatigue, and thinks that it can be overcome by training. He states that his years of observation have never revealed a single instance of a facultative albuminuria of this nature being transformed into an albuminuria of nephritic origin.

Significance of Doubly Refactile Lipoids in the Urine.—Stengel and Austin and others have referred to the presence of doubly refactile lipoids in the urine as suggestive of syphilitic kidney disease. Waldorf and Behr (*Semana Med.*, 28: 537, 1921) now report that they have always found a history of syphilis when the polariscope revealed these lipoids. They point out that the lipoid necrosis may become installed after the kidneys have degenerated from some other cause, but that syphilis alone, generally during the secondary stage, is capable of engendering it. They (same journal, 28: 661, 1921) state, furthermore, that an intercurrent disease, especially malaria, is frequently the immediate cause of the development of a syphilitic nephrosis. The symptoms are weakness, lumbar pains, anæmia, dropsy, and albuminuria. Some of their cases showed a reduction in the albumin and the œdema from thyroid treatment. A study of fifty proved syphilitics without manifest nephritis by Taylor and Taylor (*Am. Jour. Med. Sc.*, 162: 47, 1921) failed to reveal these doubly refractile lipoids. Silberman (*New Orleans Med. and Surg. Jour.*, 73: 415, 1921) reports two cases of acute nephritis in syphilitics, which responded to anti-syphilitic treatment, but does not indicate that the lipoids were looked for.

Blood in the Urine of Nephritics.—Zehbe (*Zeitschr. f. klin. Med.*, 90: 68, 1921) reports five cases of hematuria without other renal symptoms, these constituting 1.64 per cent. of his series of nephritic cases. He looks upon them as cases of focal or diffuse glomerulo-nephritis, and says that such a condition may affect one or both kidneys and that it may continue for years. The differential diagnosis is difficult and can be made only by exclusion. In one of his cases increasing insufficiency of the kidney occurred. The treatment is largely a matter of preventing further damage.

Polycystic Kidneys.—The tendency for polycystic kidney disease to be bilateral and to show signs of kidney insufficiency is so common that the following reports are interesting. Tansini (*Riforma Medica*, 37: 577, 1921) refers to a patient who had a polycystic left kidney removed and after two years there had developed no signs of involvement of the other one. Chevassu (*Jour. d' Urologie*, 11: 373, 1921) reports that primary nephrectomy in twenty-five cases with suppuration yielded 16 recoveries and that three of these were still living after four to ten years. He refers to four of his own cases.

Development of Nephritis and its Relation to Arterial Hypertension.—Volhard's theory of angiospastic ischemia, based on the fact that in acute nephritis not only the glomeruli but also the afferent vessels are found to be more or less deficient in blood, is discussed by Hülse (*Deutsche med. Wchenschr.*, 46: 1244, 1921) who concludes that the cause of the ischemia in early acute diffuse glomerulo-nephritis is to be found in functional and not organic closure of the vessels. What is at first a functional closure becomes later "anatomically fixed" through coagulation of plasma and growth of endothelium. He is unable to say whether the anatomic changes that occur in the vessels and the glomeruli are also a result of spastic closure of the vessels or not.

Kylin (*Zentralblatt f. innere Med.*, 42: 417, 1921) opposes the view of Volhard that high blood-pressure is due to a contraction throughout the whole vascular system brought about originally by the kidneys. If such were true, Kylin argues, then kidney symptoms should precede the high blood-pressure and the amount of kidney injury should bear a relation to the height of the pressure. He denies that this is true, and thinks that all the pathologic manifestations can be explained by assuming that the primary condition in so-called diffuse glomerulo-nephritis is a diffuse damaging of the capillary system by poisons produced during the course of acute infectious diseases. This is in line with the reasoning of Moschcowitz (*J. A. M. A.*, 77: 1075, 1921) who describes five cases in which hypertension and other clinical evidences of nephritis were present, although the kidneys showed but slight lesions. He considers that the hypertension itself is one of the factors in producing nephritis, and that, to all intents and purposes, the secondary contracted kidney, with hypertension, and the primary contracted kidney, with little or no hypertension, are identical, the one resulting from vascular hypertension and the other from mere vascular tension. Williams (*Arch. Int. Med.*, 27: 748, 1921) claims that arterial hypertension with normal non-protein nitrogen values in the blood and normal kidney excretion, determined by functional tests and urine examinations, does not justify the clinical diagnosis of nephritis. He too believes that there is a primary disease, arterial hypertension.

Violle (*Lancet*, 1: 1239, 1921) states that the arterial hypertension in his cases is fairly closely connected with the renal condition

so far as it is possible to discover that condition by testing the hippuric acid synthesis. He believes that this test reflects functional parenchymatous renal disturbances. The test was described by this author last year and consists in giving the patient, whose hippuric acid elimination on a fixed diet is known, 0.5 gm. each of benzoic acid and of glycocoll which synthesize in the body to form hippuric acid. The subtraction of the normal elimination from that on this test day gives the experimental figure. The fact that this test is not interfered with by certain other conditions is pointed out by Snapper (*Nederlandsch Tidjdschr. v. Geneesk.*, 1: 3044, 1921) who found that patients with croupous pneumonia, sodium chloride retention, those with complete obstruction of the common bile duct, and those with a bile fistula eliminated almost all of the hippuric acid resulting from the ingestion of 5 gm. of sodium benzoate within twelve hours. On the other hand, Kingsbury and Swanson (*Arch. Int. Med.*, 28: 220, 1921) believe that the kidney does not play the leading part in the synthesis of hippuric acid and so question the value of the test as above outlined.

Non-protein Nitrogen Constituents in the Blood of Nephritics.— In a study of the non-protein nitrogen constituents of the blood in 88 patients with hypertension and in addition with evidence of chronic nephritis Williams (*Arch. Int. Med.*, 28: 426, 1921) comes to the following conclusions, many of which are already generally accepted:

(1) Chronic nephritis with hypertension and uræmia is characterized by a marked increase in the amount of the non-protein nitrogen substances in the blood and a low phthalein excretion.

(2) Chronic nephritis of moderate degree with hypertension is associated with a moderate increase in the amount of waste nitrogen in the blood and a lessened kidney function.

(3) Cardiac inefficiency without nephritis is associated with a moderate retention of the non-protein nitrogen substances in the blood, more particularly the uric acid.

(4) In chronic nephritis with clinical and anatomic evidence of disease there is nitrogen retention and renal inefficiency.

(5) The presence of albumin and casts in the urine is not necessarily diagnostic of nephritis nor is their absence necessarily indicative of the non-existence of such disease.

(6) Improvement of the circulatory disturbances is accompanied by a decrease in the various nitrogenous extractives of the blood,

more particularly the uric acid and this may suggest that, at least, a part of the damage done the kidneys is a sequence of the alterations in its nutrition brought about by passive hyperæmia.

Relation of Urea to Uræmia.—The first theory as to the cause of uræmia was that it resulted from a retention of urea in the blood (Wilson, 1833), but later this was discarded when it was claimed by several workers that urea was relatively non-toxic when injected into animals. Leiter (*Arch. Int. Med.,* 28: 331, 1921) has now carefully reviewed the literature on this subject and reports the results of animal experiments in which dogs were injected with large doses of urea in relatively short periods of time, their symptoms noted, the changes in the urea content of the blood and urine followed, and at necropsy the pathological changes noted and the urea content of various body fluids determined. He concludes that the injection of urea, intravenously, in dogs produces a train of symptoms entirely analogous to that found in the convulsive or true uræmia of man. Lesions are produced in the alimentary mucosa that may be related to uræmic colitis. There seems to be rather definite correlation between the severity of the symptoms and the concentration of urea in the blood. He believes that chronic uræmia in man may be accounted for by urea intoxication, if we assume that the time element in the clinical cases is as important as the high concentration of urea in the animals. More work is necessary but it would seem that Leiter has shown that urea retention is at least one factor in the clinical forms of uræmia.

Prognosis in Childhood.—The prognosis of nephritis in childhood is considered by James (*J. A. M. A.,* 76: 505, 1921). His study was undertaken in order to determine how many patients who had had nephritis recovered entirely, how many developed the chronic type, the present condition of those with the chronic type, and the ultimate prognosis. He examined carefully seventy children who had had nephritis in the Children's Hospital, of Boston, during the last sixteen years; of these all but three were admitted originally with a diagnosis of acute nephritis; the other three were of the chronic type. His conclusions may be summarized as follows: In acute nephritis the greater percentage of patients recover absolutely. The prognosis in the acute exudative type, with œdema and a diminished urinary output, is less favorable than in the acute hemorrhagic

type without œdema. Only 13.3 per cent. of the sixty-seven acute cases developed a chronic type of the disease. There is no specific guide to prognosis in the chronic type; some recover functionally, though some anatomical defect may persist. Many cases will stand severe infection without acute exacerbations of nephritis, but the latter are especially prone to follow upper respiratory infections.

Potassium Chloride as a Diuretic.—Potassium chloride, unlike sodium chloride, increases the output of urine, acting like a powerful diuretic, according to Blum, Aurel, and Lévy (*Bull. de la Société Méd. des Hôp.,* 45: 955, 1921). It proved effectual in some cases when all other diuretics had failed. In those predisposed toward diarrhœa it has a laxative effect, and if not properly eliminated it produces nervous symptoms, weakness, fatigue, headache, and chilliness. If there are cardiovascular disturbances, it may produce dyspnœa, cyanosis, a sense of morbid apprehension and extra systoles, and the blood-pressure may fall. To avoid such symptoms he recommends that the dose be kept below 5 to 7.5 gms. in the twenty-four hours, and that one begin with only 1 gm. a day.

Effect of High Protein Diet.—Squier and Newburgh (*Arch. Int. Med.,* 28: 1, 1921) show that a high protein diet may be a renal irritant but they confirm Mosenthal in the opinion that it does not affect blood-pressure. As a result of the high protein diet they secured an increase in œdema, macular changes in the fundus of the eye, red cells in the urine, and an increase in albuminuria. More recently Squier (*Mich. State Med. Soc. Jour.,* 20: 378, 1921) has reported two cases, in one of which there was a history of three separate exacerbations of nephritic symptoms following the addition of meat or meat extractives to the diet. In the second case they observed the same thing under experimental conditions, and in this case the blood urea increased from 18 to 84 mg. per hundred c. c., the albuminuria increased from 6 to 35 gm. per liter, and the sulphone-phenolphthalein elimination was diminished from 40 to 28. There was also some increase in œdema.

Kidney Decapsulation.—Edebohls' operation of decapsulation of the kidney, originally recommended for chronic nephritis of the glomerular type, which had fallen into more or less general disrepute, again is brought to our attention by a number of articles in the literature of the past year, but now the emphasis is on its value

in the parenchymatous or tubular variety of the disease. Fowler (*Edinburgh Med. Jour.,* 26: 111, 1921) reports three cases of the latter variety which were relieved of their urgent symptoms by this procedure. Fraser (same journal) believes that it should be tried in all cases of chronic nephritis which do not improve under medical treatment. He advises that both kidneys be stripped but only one at a time. Simpson (same journal) reports four cases in children which were benefited. There had previously been but eleven cases in children so treated (Comby, *Arch. de Méd.,* 24: 558, 1921). Kidd (*Brit. Med. Jour.,* 1: 378, 1921) is convinced that not only does benefit result from the operation in parenchymatous nephritis, but even cure. Karo (*Münch. med. Wchnschr.,* 67: 1200, 1921) considers it strongly indicated in uræmia brought on by anuria and believes that in such conditions it saves many lives. He recommends it also for painful and hemorrhagic nephritic cases.

This operation has also been performed for severe eclampsia. Lubbert (*Münch. med. Wchenschr.,* 67: 1385, 1921) reports two such cases in which there was marked albuminuria and oliguria, recovery ensuing in both, and Brindeau (*Gynécol. et Obstétrigue,* 3: 275, 1921) recommends that it be tried when other measures fail.

DISTURBANCES OF THE STOMACH

Anatomy and Physiology.—In his studies on the anatomy and muscular action of the small intestine, which apply equally to the stomach, Carey (*International Jour. Gastro-enterology,* 1: 1, 1921) claims to have demonstrated a spiral arrangement of the internal and external muscular coats. He has seen 10 to 15 turns of a single fasciculus of the inner muscular layer and finds that a complete left hand turn is made every 0.5 to 1 mm., whereas the outer fasciculi make a complete left hand turn only in every 200 to 500 mm. If this anatomical arrangement is confirmed it may radically alter many of our ideas in regard to gastrointestinal physiology. Already Carey advances a new theory of peristalsis, claiming that it is merely a duplex contraction phenomenon, the wave of contraction and the preceding wave of relaxation both being dependent upon a single direct stimulus to the two muscular coats at the same place and time. The arrangement of the respective muscle fibres results in a differential rate of progression of the two waves. This puts peristalsis

on a purely muscular basis without the necessary intervention of any nerve elements.

This work is in accord with the present tendency to place greater emphasis on the inherent character of involuntary muscular action and to think of the gastrointestinal tract as a whole, acting according to the same principles throughout. Wheeler and Thomas (*Jour. Lab. and Clin. Med.,* 6: 124, 1920) for instance show that contractions and relaxations of the antrum and pylorus follow each other in a regular sequence, whether food is present or not. The phases of activity of the sphincter are such as to supplement those of the antrum. Thus the activity of the antrum determines the activity of the sphincter. This supplements the recent work of McClure and Reynolds who showed that the acid control of the pylorus is of minor importance.

The Gastric Contents.—Dauwe (*Archiv. Méd. Belges,* 73: 578, 1920) believes in the inheritance of gastric secreting functions and describes 12 examples of inherited achylia or hypersecretion. He is impressed with the longevity of families in which hypersecretion is common and looks upon it as an expression of general vigor. The families in whom achylia is common have poor teeth, little appetite, intestinal indigestion, and a tendency to atony. The achylia develops at a certain period of life, just as the members of a family may all become bald at a certain age.

Best (*Am. Jour. Med. Sc.,* 160: 889, 1920) describes a method of completing a fractional gastric analysis in two hours which has several advantages. After removal of the fasting contents the tube is withdrawn and not reintroduced until one-half hour after the meal is given. This allows digestion to proceed unhampered by the tube for this period. He then removes seven fractions at 15 minute intervals and with the last one all the remaining gastric contents. The amount of the seventh specimen (end of two hours) gives a good idea as to retention and corresponds with the retention shown by röntgenological examination. He emphasizes the value of the type of acid curve obtained irrespective of the acid figures, and indicates that in gastric and duodenal ulcer and in gall-stones there is a high fasting acidity and a steady rise in the acid curves to the end of the two hour period, whereas in cases of distant infections and in gastritis the total acidity curve is of normal or low value and the hydrochloric acid curve irregular and not symmetrical. In long

standing chronic gastritis and in tuberculosis and in syphilis the total acidity curve is moderately low and hydrochloric acid is present often in only one or two samples.

Rehfuss and Hawk (*J. A. M. A.*, 76: 371, 564 and 1340, 1921), have contributed three articles on gastric analysis in which they point out that such a study has 3 functions: (1) The determination of evacuation time, (2) the determination of secretory activity and work, and (3) the discovery of pathologic products which offer a clue to the type of disease present. They show that there are marked variations of evacuation and of secretion in health, and especially do they minimize the importance of high acidities in disease. Two periods comprise normal digestive activity, they say, one of gastric work in response to a stimulus and the other of gastric rest (the interdigestive period). The stomach, however, is never entirely empty. The interdigestive period reveals 3 phenomena: (1) Motor, in which peristole and tonal and hunger contractions supplant peristalsis, (2) a lessening in secretory velocity and a reduction to one half in acidity, and (3) an alteration in the status of the stomach and duodenum. In disease the interdigestive period may be completely obliterated. The residuum, representing the interdigestive phase, is abnormal when it equals 100 or more c. c. If there is no food retention an excessive residuum may be psychic or due to an excess of tobacco or vagotonia, it may also occur in duodenal ulcer, chronic appendicitis, or cholelithiasis. If, in addition, there is food retention there is usually (98 per cent.) an organic lesion in or near the stomach: (1) Atony or dilation, (2) obstruction by neoplasm, gastric or duodenal ulcer, or syphilis, or (3) extragastric pathology, as tumor, adhesions, or inflammatory masses. Blood is found in 80 per cent. of malignant cases, but not so frequently in ulcer. Microscopic pus was found in 37 per cent. of 400 cases, and it may be due to nose and throat affections, pulmonary lesions, etc. In 98 per cent. it was extragastric in origin and so this finding is suggestive evidence of infection above the cardia.

Contrary to Rehfuss and his co-workers, who accept a residuum under 100 c. c. as normal, Hayem (*Bull. de la Société Méd. des Hôp.*, 44: 1523, 1920) declares that the normal stomach is empty after digestion is concluded and that fluid in the morning fasting stomach is always a sign of disease.

Gorham (*Arch. Int. Med.*, 27: 434, 1921) points out certain fallacies in the fractional analysis of the gastric contents as now quite commonly practiced. By aspirating in rapid succession 10 c. c. portions of the gastric contents and studying them he found marked variations in the acidity and is therefore lead to believe that the stomach contents is not a hemogeneous mixture and that no single fraction can be representative of the whole. This determination, which is not a new one but one which needs emphasis at this time, raises a serious question as to the value of fractional analysis.

Poppens (*Am. Jour. Med. Sc.*, 161: 203, 1921) in a study of the bacteriology of the fasting stomach and duodenum of dogs found the bacillus coli much more frequently in the duodenum than in the stomach. Non-hemolytic streptococci were rarely found and hemolytic streptococci not at all. Staphylococci were found in eleven of fifteen stomachs and in but three of fifteen duodenums.

By giving 0.04 gm. extract of opium 2 or 3 hours before a test breakfast Jarno (*Arch. f. Verdauungskr.*, 27: 91, 1921) finds that he can promote the secretion juice in cases where this function is not entirely lost. By so doing he got almost normal acidity in previously severely hypoacid cases.

Leist and Weltman (*Wiener Arch. f. inn. Med.*, 2: 245, 1921) find that in cases of dropsy gastric secretion is at a low ebb. The retention of chlorides in the tissues may be responsible for this finding.

Dodds (*Lancet*, 2: 605, 1921) by testing the alveolar air has demonstrated that the tension of carbon dioxide in the blood varies with the amount of secretion poured out by the stomach, the CO_2 tension increasing (that is, the blood becoming more alkaline) as acid is poured into the stomach.

Fischer (*Schweizerische med. Wochenschr.*, 50: 1139, 1920) has shown that in dogs with a Pawlow fistula hot-air baths have reduced the gastric secretion by 50 per cent. and he therefore suggests their use in the treatment of hypersecretion cases.

Gastric Ulcer.—The literature on gastric and duodenal ulcer for the past year reveals little that is new or of striking importance in the etiology, diagnosis, or treatment of this disease. It concerns itself mainly with the matter of treatment, but still leaves one in doubt as to the most satisfactory manner of handling the individual case. This will perhaps continue to be true until the pathogenesis of the

disorder is definitely established. The following articles have seemed worthy of brief abstract.

Syphilis as a probable strong factor in the etiology of peptic ulcer has been emphasized by Erdman (*Annals of Surgery,* 73: 434, 1921). Out of five duodenal perforations, in which the ulcerated area was excised, three showed evidence of syphilis. Brams (*Arch. f. Verdauungskr.,* 27: 375, 1921) discusses the symptomatology of syphilitic gastric ulceration based on 7 cases proved at autopsy and 30 others presumably of that nature. Epigastric pain was the most frequent complaint and it usually had a relation to meals and was relieved by alkalis and vomiting. Even in advanced cases the pain ceased when the stomach was empty. Hematemesis occurred in 13 instances. In 14 cases there was no free hydrochloric acid and in 6 others extreme hypoacidity; in 18 there was epigastric tenderness; and in 25 a palpable tumor was discovered. Syphilitic changes in the liver were found in 3 of the autopsied cases, and splenic enlargement in 3 of these and in 1 other. Only when the benefit from syphilitic treatment is durable, he says, is it decisive diagnostically.

Of five syphilitic cases reported by Rinker (*Virginia Med. Monthly,* 48: 278, 1921) 4 complained of pain in the pit of the stomach and on the right side, one vomited blood several times, all had burning in the stomach when they went without food, four being relieved of this for one or two hours by food or soda, and two had lost 20 to 35 pounds in less than a year. Anti-syphilitic treatment was effective in these cases.

Sparman (*Deutsche Zeitschr. f. Chirurg.,* 164: 136, 1921) calls attention to similar cases in which the diagnosis of malignancy had been made. The only characteristic feature for syphilis, he claims, is the fact that the lesions are often multiple. He refers to a case of Fränkel's in which there were thirteen ulcers and to one of Bitter's in which there were seven. Gastric secretion is usually reduced. Operative treatment is often indicated.

Kocher (*Arch. f. Klin. Chirurg.,* 115: 86, 1921) contributes an important article on gastric and duodenal ulcers in which he argues that in the majority of cases the ulcer is only one manifestation of a general pathological condition. Thus he explains the frequent recurrences with either medical or surgical treatment, neither curing the underlying constitutional disease, be that vagotonia, sympatheticoto-

nia, arteriosclerosis, or what not. He claims better results with gastroenterostomy than with resection.

Muller (*Beiträge zur klin. Chirurg.*, 123: 1, 1921) argues that embryonal factors are responsible for the tendency to ulcer, the latter developing in the pylorus and duodenum at the junction of the gastric and duodenal mucosa and in the stomach at the junction of normal mucosa and islands of intestinal mucosa, when the developing cells are not quite of normal type.

According to Campo (*Arch. f. Vergauungskrh.*, 28: 69, 1921) gastric hyperacidity and peptic ulcer are one and the same. He does not believe that the pain complained of in these cases is due to active contractions of the stomach wall and makes reference to the frequency of active gastric contractions seen fluoroscopically without pain. He still believes the pain is due to stimulation of the ulcer tissue by acid. In this belief, based on a large clinical experience, Campo is at variance with the majority of gastroenterologists of the present time.

Moser (*J. A. M. A.*, 76: 106, 1921) reports a case of pyloric ulcer, proved at operation, which had vomited eleven feet of tænia saginata and in whose stools were found the heads of T. saginata and T. solium, also the larvæ of strongyloides intestinalis. He suspects that the tænia saginata, which had evidently taken up its position near the pylorus, was at least partially the cause of the intense epigastric pain which the patient suffered before its expulsion. After this he quickly recovered from all his symptoms, but they subsequently returned and then the ulcer was disclosed. He raises the question as to the relation of the parasite to the ulcer. In this connection it is interesting that Birt (*Deutsche Zeitschr. f. Chirurg.*, 165: 1, 1921), from his eleven years of surgical work in Shanghai, has concluded that the amœba is responsible for a large proportion of typical gastric and duodenal ulcers.

Keppich (*Berl. klin. Wchnschr.*, 58: 414, 1921) has succeeded in producing chronic gastric ulcers in rabbits by irritating the vagi with weak faradic currents; also by cutting and by ligating the vagi.

The thread test for ulcer, introduced some years ago by Einhorn, is the subject of a paper by Moffert (*Schweizerische med. Wochenschr.*, 51: 202, 1921) who condemns it. His conclusions are based on the study of forty-four men and fifty-four women. He states that the

difference in the distance from the teeth to the pylorus may vary from twenty to thirty cm. in different persons and even at different times in the same person, this rendering the test valueless so far as determining the location of the ulcer is concerned. The result, furthermore, may be positive when there is no ulcer (especially in certain vagotonia cases) and it may be negative when there is a lesion. In fifty-six normal persons the thread showed the stain in 41 per cent., in twenty-two cases of gastric ulcer the thread was stained in only 36 per cent.

Peiper (*München med. Wochenschr.,* 67: 1116, 1920) from a study of various occult blood tests on the stools of fifteen cases of gastric and duodenal ulcer, seven of gastric carcinoma, ten of cholecystitis, one of echinococcus infection of the liver, and six of hypochlorhydria concluded that the differentiation between carcinoma and ulcer on that basis was not reliable and that for the surgeon at least it had no significance. This was due especially to the difficulty in obtaining an unequivocable demonstration of the occult blood. On the other hand, Lutz (*Arch. f. klin. Chir.,* 115: 780, 1921) states that among thirty-two cases of ulcer that came to operation twenty-seven showed blood in the stools, while five which gave a persistent negative reaction showed only stenosis and scar tissue at operation. He admits, however, that the absence of blood in the stools is of little importance in ulcer, but that a series of negative results is good evidence of the absence of cancer. He considers that a persistent negative examination for blood in the stomach contents and the persistent presence of a positive test in the stools points to duodenal ulcer.

Faber (*Ugeskrift for Læger,* 83: 491, 1921) found hyperacidity in only 21 per cent. of 61 operative cases of juxtapyloric ulcer, but continuous hypersecretion in 75 per cent. of them. The percentages were much less for ulcer of the body of the stomach. He emphasizes that intestinal disturbance is often responsible for the hypersecretion or hyperacidity. He believes that an ulcer cure by medical means alone can be counted on if there have been only 3 years of ulcer symptoms.

Savignac and Alivisatos (*Arch. des Mal. de l'App. Digestif.,* 11: 73, 1921) have found on record but six cases in which chronic gastric ulcer simulated the gastric crises of tabes, and they add three more.

The ulcers were on the lesser curvature and induced a chronic neuritis, and the patients were neuropathic. They urge vigorous treatment in these cases and advocate operative measures. The violent pains and profuse vomiting differ from those of tabetic crises only in that they are accompanied by the usual physical signs of ulcer and in the benefit derived from rest and diet. Klippel and Weil (*Arch. des Malad. de l'App. Digestif.*, 11: 280, 1921) add 3 other cases with accompaning polyneuritis suggesting tabes. They explain that hematemesis with tabes generally occurs during a gastric crisis and after vomiting, while the hematemesis of gastric ulcer or cancer may occur at any time. They found but 6 cases of tabetic hematemesis reported.

Muller and Ravdin (*Annals of Surgery*, 74: 223, 1921) found that 26 per cent. of their series of 15 cases of gastric perforation had this event as the first sign of abdominal pathology.

Le Noir, Richet, and Jacquelin (*Bull. de la Société Méd. des Hôp.*, 45: 121, 1921) who last year called attention to the frequent association of liver and kidney disease with gastric ulcer now state that in thirty-eight ulcer cases uræmia was pronounced in fifteen and attacks of digestive hemoclasis (suggestive of liver dysfunction) were constant in 75 per cent. of twenty ulcer cases. Gandy (same journal, 44: 1423, 1921) claims to have pointed out this relationship 20 years ago. Still later Le Noir (*Annales de Méd.*, 9: 225, 1921) reports that pathologic conditions were found in the kidneys or liver of 5 patients who had died three to eleven days after a successful gastroenterostomy. Functional tests applied to 43 other patients with gastric ulcer showed liver insufficiency in all of the 23 tested for alimentary glycosuria, coagulation time, digestion hemoclasis, and urobilinuria. The insufficiency was most marked in the long standing cases. Bleeding from the ulcer was more marked in the cases with impaired liver functioning. Operative shock in such a case may be due to liver or kidney pathology. Coma with acidosis and grave jaundice are other forms in which this liver or kidney trouble may show itself. So anæsthetics that injure the liver should be avoided. Also, he urges that operations should not be delayed in these cases. He believes that the open ulcer generates local septic complications and allows the passage into the blood, and hence to the liver and kidneys, of foreign proteins not acted upon by the gastric juice. The resulting

damage modifies the symptoms, the course, and the prognosis of gastric ulcer.

Horsley (*J. A. M. A.*, 76: 952, 1921) believes that the value of the Sippy form of treatment lies not in its neutralization of the gastric contents but rather in that by reducing the acidity it lessens peristalsis. He points out that we do not neutralize urine acidity to secure the healing of a bladder wound, that a mouth wound heals in the presence of its normal alkaline secretion, and that the gastric acidity does not interfere with the healing of a properly sutured stomach wound. It is the rest that results from reducing the acidity that is valuable.

Shattuck (*J. A. M. A.*, 77: 1311, 1921) has followed 28 cases of ulcer, 6 gastric and 22 duodenal, treated according to the technique described by Sippy for six to twenty-four months. Twenty-two remained free of symptoms throughout the period of observation. Ten of 17 cases studied with the Ewald meal showed no reduction in acidity, though all but 2 of these were rendered symptom-free. Hypersecretion was reduced in less than half the cases. Occult blood disappeared in all the 6 cases in which it was found after three weeks. Five of 7 duodenal cases followed for one to two years showed improvement röntgenologically but 2 did not. The niche deformity and six hour residue disappeared in 5 of 6 lesser curvature cases. The author cautions against too readily drawing conclusions as to ultimate cure on account of the short duration of observation. He does not indicate the stage of development of the ulcers in his series.

In an analysis of 1086 cases of gastric or duodenal ulcer Cohnheim (*Arch. für Verdauungskr.*, 27: 241, 1921) has been impressed with the recurrences of symptoms in the spring and fall. He believes this to be due to an afflux of blood to the abdominal organs at these seasons, and he advises patients with a tendency to ulcer to take over a period of from 4 to 6 weeks, beginning in March and September, an emulsion of oil with atropin, half an hour before eating, and, one hour after meals, he gives a mixture of 20 parts each of sodium sulphate and sodium phosphate with 60 parts of sodium bicarbonate. He gives this same treatment after gastroenterostomy to prevent the development of peptic ulcers. In this way he claims to have warded off for years recurrences in patients subject to ulcer. The oil emulsion is made with one egg yolk stirred into 3 teaspoonfuls of olive oil, then

diluted with a glass of tepid water. To this he adds 0.25 mg. of atrophin per dose.

Buckstein (*J. A. M. A.*, 76: 231, 1921) presents röntgenologic evidence of the healing of gastric ulcers under rest. In a patient with a marked lesion on the lesser curvature the stomach was rested by jejunal feedings over a period of 8 weeks, after which mouth feedings were resumed. Röntgen studies from time to time showed the gradual healing of the lesion and improvement in the emptying time of the stomach. He gave through the tube first peptonized milk, later adding dextrose and white of egg, and still later egg yolk. Three feedings a day by the drop method were given and at night 15 to 30 c. c. of orange juice were added for its laxative effect. He found it possible to give at a single feeding 300 c. c. of peptonized milk, 60 gms. of dextrose, 30 c. c. of cream, and the whites of two eggs; and shortly after each feeding 20 c. c. of olive oil. On such a diet for 8 weeks his patient lost only 7 pounds in weight. He attached the bulb with chromic gut so that it might soon be freed and changed the position of the end of the tube from time to time in order to avoid irritation of the intestinal mucosa. Clinical improvement paralleled that shown in the röntgen plates.

Rabinovici (*Progrès Méd.*, 36: 415, 1921) believes that bismuth is of benefit to ulcers only when they are so placed that the drug coats them as it settles to the bottom. In some ulcers therefore he advises that the patient recline with the pelvis raised.

Aigrot and Gaillard (*Lyon Méd.*, 130: 245, 1921) report four cases of tuberculosis of the lungs in ulcer cases and urge operative treatment the same as in the non-tuberculosis.

Ramond (*Progrès Médical*, 36: 265, 1921) reports a case with an hour-glass stomach which persisted over 20 years, the operation at the end of that time showing that the ulcer had entirely healed, this suggesting to him that the persistent constriction had been functional.

Tumors.—Merrill (*Boston Med. and Surg. Jour.*, 184: 181, 1921) reports a case of polypoid adenoma and one of fibroma of the stomach. In both the diagnosis was made röntgenologically. The growths were removed at operation.

Broders and Mahle (*Jour. Lab. and Clin. Med.*, 6: 249, 1921) report that twelve cases of primary lymphosarcoma of the stomach were observed in the Mayo Clinic between January, 1913, and Decem-

ber, 1920, of which eleven were in males. The average duration of symptoms was six months and the average age forty-six. Seven of them were diagnosed as carcinoma. Six were operated upon, the other six being considered inoperable. Of the resected cases two died of peritonitis; one died 4 months after operation from a recurrence in the liver and lower bowel, and two others were known to have recurrences. The other patient was operated upon shortly before the publication appeared.

An analysis of 182 cases of cancer of the stomach with special reference to the incidence of preëxisting ulcer is presented by Taylor and Miller (*Am. Jour. Med. Sc.,* 162: 862, 1921). They secured a history suggestive of preëxisting ulcer in only 17 per cent. of these cases, and after a critical analysis of the literature on this subject come to the conclusion that the true incidence probably does not exceed that figure. They point out that the infrequency of cancer in the duodenum, where ulcer is common, argues against the importance of such a preëxisting lesion, as does also the fact that only rarely have proved ulcer cases while under observation developed malignancy. They found, furthermore, that the age incidence for the beginning of "ulcer" symptoms in their ulcer-before-cancer cases had its apex two decades later than did a series of 79 ulcer cases, this suggesting to them either that ulcers first giving rise to symptoms in middle life have a far greater likelihood of becoming malignant than do ulcers generally or that the ulcer-before-cancer cases are really malignant from the beginning. Either of these considerations justifies and indicates, they claim, prompt and radical surgical treatment of all patients first developing symptoms suggestive of ulcer after forty years of age.

In their series the average free hydrochloric acid and total acidity findings in the pyloric cancers were not abnormally low (15.5 and 45), but there was definite evidence of retention. When the cancer was situated elsewhere retention did not occur, but the acid figures were distinctly low. A free hydrochloric acid figure above 40 was found in 4.5 per cent. of the cases while 68.4 per cent. had an achlorhydria. Röntgen study gave a positive diagnosis in 96.8 per cent., and in but one case was it misleading. At operation the tumors were shown to be somewhat more extensive and more often to involve the lesser curvature than the röntgen ray examination suggested. They point out, finally,

that of the patients with gastric cancer who now come to the surgeon about one third are given a chance of cure by radical operation, one third are treated palliatively, and for one third nothing can be done.

C. H. Mayo (*J. A. M. A.*, 77: 177, 1921), in discussing the frequency of development of gastric cancer on gastric ulcer, is much more conservative than were certain members of that clinic a few years ago and admits that the matter can be estimated accurately only by years of observation. He believes, however, that it is greater than one in six (17 per cent.).

Carman (*J. A. M. A.*, 77: 990, 1921) claims to be able to differentiate by the röntgen ray ulcerating gastric cancers which are 3 to 8 cm. or more in diameter from ulcers. He calls attention to 3 distinguishing points: (1) By squeezing out the opaque mixture by hand under the fluoroscope, in cases of cancer, a cresentic meniscus-like shadow is left showing the ulceration when the ulcer is on the posterior wall near the lesser curvature or on the vertical portion of the lesser curvature. It appears as a circular shadow when the ulcer is on the posterior wall well away from the lesser curvature. (2) In cancer the niche is with difficulty emptied of the barium, whereas in simple ulcer this is easily accomplished. (3) In cancer the crater is on the mucosal side of the gastric wall while in ulcer it penetrates the wall.

Gastric carcinoma in early life is quite rare and therefore the case reported by Laird (*Edinburgh Med. Jour.*, 26: 98, 1921) deserves mention. A boy of 15, without suggestive heredity or personal medical history, presented a palpable epigastric tumor and achlorhydria. At laparotomy an inoperable growth, proved to be columnar celled carcinoma, was found. There was extensive metastasis.

Miller (*J. A. M. A.*, 76: 229, 1921) reports a case of polypoid carcinoma of the stomach in a man of 31 years which apparently developed upon a benign pedunculated lesion and in which thorough study 18 months before death justified capable clinicians in a diagnosis of primary pernicious anæmia. It is his belief that the anæmia was dependent upon hemorrhage from the benign lesion. The blood picture subsequently improved and shortly before death, following an exploratory operation, it was practically normal.

In a consideration of the early diagnosis of gastric cancer Ortiz (*Revista Espanola de Med. y. Cirugia*, 3: 528, 1921) points out the significance of lecithin in the gastric contents. He was led to suspect

its presence in undue amounts because of its occurrence in embryonal bodies, such as egg yolk, semen, graafian follicles, fish spawn, etc. Because of the pseudo-embryonal character of the cells of cancer he believed he might find extra amounts of it in such cases. The patient must first be put upon a lecithin-free diet and the stomach lavaged the night before. He found larger quantities of it in the softer neoplasms. He regards it as one of the simplest and most reliable means for an early diagnosis, stating that the lecithin production presumably starts with the incipiency of the malignant disease.

Occult bleeding as a valuable diagnostic sign is emphasized by Fricker (*Schweizerische med. Wochenschr.*, 51: 174, 1921) who found it in 170 of 176 cases. When it appears constantly in a case of apparently benign achylia or other vague stomach disturbance he considers it an indication for operation.

The sugar tolerance test as a diagnostic aid is further considered by Friedenwald and Grove (*J. A. M. A.*, 76: 1606, 1921) who report 72 positive tests in 75 positive cases. They distinguish four blood sugar curves: (1) Normal, (2) atypical normal (achylia gastrica), (3) intermediate (carcinoma of other parts of the body), and (4) gastric carcinoma curve (high blood sugar). Tabes, nephritis, tuberculosis, and thyroid conditions must be excluded.

Duodenal Ulcer.—Friedenwald and Sindler (*J. A. M. A.*, 77: 1469, 1921) have made fractional analyses of the duodenal contents in 10 normal individuals, collecting the fractions at half hour intervals, and conclude that the degree of alkalinity is usually highest in the fasting state, falling immediately after a test meal of beef bouillon is given and then gradually rising. The duodenal curve bears no relation to the curve of gastric acidity. A similar effect was observed usually in regard to the ferments, the strength of one ferment being wholly independent of the other. The examination for the ferments was made with Einhorn's special agar tubes.

McClure, Weymore, and Reynolds (*J. A. M. A.*, 77: 1468, 1921) have determined the enzymatic activities in hourly specimens of duodenal contents derived from fifteen normal young men after the ingestion of a standard meal and on the basis of this work have stated normal minimal figures. This work will be of value in the further study of duodenal functions.

Einhorn (*J. A. M. A.*, 77: 1471, 1921) presents observations on

the fractional examination of the duodenal contents in forty cases of peptic ulcer. Although he found a tendency toward an acid state of the contents in less than half of the cases he believes this to be of some diagnostic importance.

In 18 cases of ulcer of the second portion of the duodenum Parturier and Aimard (*Bull. de la Société Méd. des Hôp.*, 44: 1666, 1921) found gastroptosis in 80 per cent. and sagging of the duodenum in 50 per cent. There was tenderness at a point about the centre of a line drawn from the tip of the right tenth rib to a point at the centre of a line joining the tips of the iliac crests. There was also a tender point in the left side of the neck. The diagnosis is often confused with gall-stone colic, but rapid gastric evacuation points to duodenal trouble. Quain (*Annals of Surgery*, 72: 604, 1921) believes that duodenal ptosis is not at all uncommon and has done duodeno-jejunostomy in four of his five cases with good results.

Leveuf (*Revue de Chirurg.*, 39: 616, 1920) reports in detail two cases of chronic occulsion of the duodenum from compression by the mesentery and reviews twenty-eight others from the literature. When change of position and other medical measures fail he favors colopexy with or without duodeno-jejunostomy. One of his cases yielded to postural treatment.

Duval and Gatellier (*Arch. des Maladies de l'App. Digestif.*, 11: 145, 1921) discuss chronic stenosis below the ampulla of Vater due to congenital malformation by an artery. They describe some cases and refer to the anatomic findings in 46 others.

Even with a typical history, the usual clinical findings, and the röntgen ray the diagnosis of duodenal ulcer cannot be made with certainty. Foerster (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 32: 587, 1920) reports nine cases in which the diagnosis seemed beyond question, and yet operation revealed merely adhesions. In six of the cases there was no evidence of previous ulceration, while in one there had been hemorrhages and in another there were signs of a healed lesion at operation. In only one instance was there anything to suggest previous gall-bladder trouble. In these cases he believes little can be accomplished even by breaking up the adhesions, because the tendency to adhesion formation persists.

Lafferty (*Am. Jour. Roentg.*, 8: 315, 1921), in an analysis of 1100 röntgen ray examinations of the gastrointestinal tract, found

that 33 per cent. of the duodenal ulcer cases were accompanied by a chronic appendicitis. He believes that the appendicitis gives rise to pylorospasm which in turn produces a hyperacidity thus contributing to an erosion which subsequently becomes infected.

Kelling (*Arch. f. Verdauungs-Krank.,* 28: 63, 1921) believes that the occasional association of gall-stones with duodenal ulcer may be explained by the infectious agents getting to the liver from the intestine by the venous and lymphatic routes and their elimination through the bile. As the bacteria pass into the duodenum peristalsis may force them into the follicles with the subsequent development of an ulcer.

Jatron's (*Wiener Arch. f. inn. Med.,* 2: 535, 1921) tests of thirty persons with ulceration in the stomach or duodenum failed to disclose any evidence of dysfunction of the vegetative system, and Schnabel (*Med. Clinics of North America,* January, 1921), from a study of the gastric functions in cases of internal secretory disturbances, concluded that the relationship to the glands of internal secretion was still a mooted question.

Schmidt (*Deutsche Zeitschr. f. Chirurg.,* 166: 242, 1921), in reviewing twenty-six cases of duodenal ulcer, discovered that in about one-half perforation had given rise to the first symptom. Ewart (*British Med. Jour.,* p. 420, March 19, 1921) reports a case in which straining in urination was the actual cause of rupture. Alsberg (*Arch. f. Verdauungs-Krankh.,* 27: 396, 1921) found at operation an old healed duodenal ulcer with a recently perforated ulceration in a child of 2 years. The case had been diagnosed as intussusception. Schalij (*Nederlandsch Tijschr. v. Geneeskunde,* 1: 10, 1921) has been impressed with the frequency of pain in the back in many of the cases.

Miller (*Med. Clinics of North America,* November, 1921) classifies duodenal ulcer from the therapeutic standpoint as follows: (1) Simple non-deforming, (2) early deforming, (3) stenosing, and (4) penetrating and perforating. He considers that (3) and (4) should always be treated surgically, that (1) can usually be managed medically, and that (2) can often be given as much relief medically as surgically, especially when the patient's circumstances permit prolonged thorough-going medical treatment, but that where such medical treatment fails surgery should be resorted to.

An hemangioma of the duodenum, the only one encountered at the Mayo clinic, is reported by Carman (*Am. Review of Röntgenology,* 8: 480, 1921). The röntgen picture, the duodenum being shadowed as a ring with a translucent centre, suggested a polypoid growth. At operation there was found in the first portion of the duodenum the tumor, 7 cm. by 5 cm., with a sessile attachment to the duodenal side of the pylorus.

Salis (*Deutsche Zeitschrift f. Chirurg.,* 160: 180, 1920) describes a case of myosarcoma of the duodenum in a man of 40 with symptoms extending over seven years and comments on the difficulty in diagnosis. Four cases of carcinoma of the duodenum, two being primary, are recorded by McGuire and Cornish (*Annals of Surgery,* 72: 600, 1921). The other two were primary in the bile duct.

Spence (*Lancet,* 1: 908, 1921) reports a case of syphilitic duodenal ulcer in which a cure was effected by treatment with arsphenamin, mercury, and potassium iodide. Both the diagnosis and the cure were confirmed röntgenographically. (See also under gastric ulcer.)

BILIARY DRAINAGE

As more and more evidence accumulates on the subject of non-surgical biliary drainage certain of the original claims for the Lyon-Meltzer method lose their significance. Dunn and Connell (*Jour. Am. Med. Asso.,* 77: 1093, 1921) report a very interesting case on which a hepato-duodenostomy had been done, a duodenal fistula resulting, and which afforded them an opportunity for certain experiments on this subject. The patient had no gall-bladder or common duct and the fistula afforded a ready method of introducing a catheter into the duodenal recess which received the bile drainage. By introducing into the duodenum a concentrated solution of magnesium sulphate they secured the three types of bile described by Lyon: (A) pale yellow, (B) darker and more viscid, and (C) clear yellow bile of low specific gravity, claimed by the latter to represent respectively duct, gall-bladder, and liver bile. Thus they proved that the gall-bladder and common duct were not essential to the ABC sequence. They then introduced a catheter 32 cm. into the jejunum by way of the fistula and through it injected the magnesium sulphate solution. Again they secured the ABC sequence of bile, and furthermore they were able to show that there was a correspondence in the samples

between the curve of the bile pigment concentration and the curve of the magnesium concentration. The gram-molecular concentrations of SO_4 did not follow those of Mg. in the proportion of $MgSO_4$, and milk introduced through the catheter was not regurgitated into the duodenum, so they felt justified in concluding that regurgitated magnesium sulphate could not account for the curve of magnesium in the samples. Furthermore, they think it unlikely that the small concentration of magnesium sulphate, as calculated from the magnesium content of the bile samples, could act on the duodenal mucosa to produce bile flow in the manner set forth in the Lyon-Meltzer hypothesis. Their results suggest rather that the magnesium is absorbed and carried to the liver by the portal or lymphatic system where it acts as a cholagogue, producing a bile rich in pigment.

Crohn, Reiss, and Radin (*J. A. M. A.*, 76: 1567, 1921) in a discussion of their experiences with the Lyon test in seventy cases state that they secured the ABC sequence in 65 per cent., and that in 62 per cent. of these there was pathology in the gall-bladder. In the other 38 per cent. the gall-bladder and ducts were pronounced normal at the operating table. In one case that had no gall-bladder they secured the typical A B and C types. In some instances the gall-bladder was aspirated directly at operation and the bile was always found to be darker and more mucoid than the B bile from the duodenum. They obtained the same results with sodium sulphate as with magesium sulphate, as has also Einhorn (*N. Y. Med. Jour.*, 113: 313, 1921). Crohn et al. have not succeeded in utilizing the test for the identification of cases of chronic gall-bladder disease, and Einhorn (*N. Y. Med. Jour.*, 114: 262, 1921) believes that diagnostically many more valuable hints regarding gall-bladder lesions can be found by the examination of the natural fasting bile. In jaundice, however, he considers the injection of magesium sulphate or peptone of diagnostic value since it will sometimes force bile into the duodenum which would not otherwise get there.

DISTURBANCES OF THE LIVER

Febrile Syphilitic Disease.—Fever lasting for months and years as a feature of tertiary syphilitic enlargement of the liver is discussed by Gilbert and his co-workers (*Bull. de la Société Méd. des Hôp.*, 45: 417, 1921) who have on record five such cases. In none of these was

jaundice present. The fever yielded to mercurial and arsenical treatment, although it had been present with only brief remissions for from two months to six years, but the liver did not always return to normal size. They suggest that fever in any form of syphilis may be due to latent involvement of the liver and think that their cases may represent the incipient form of definite syphilitic liver disease.

In the discussion of their paper Netter reported a case with fever for twenty years which disappeared after two mercurial injections. Abrami pointed out that amœbic disease of the liver sometimes subsided under arsenical treatment and that this must be kept in mind when making a diagnosis. Mercury differentiates the two, since only syphilis will respond to this while both respond to arsenic. Dufour stated that it was sometimes necessary to operate in cases of syphilis of the liver, referring to a patient from whom eight suppurating gummatous tumors had to be removed before there occurred any improvement.

Alvarez (*Revista Méd. del Uruguay,* 24: 337, 1921) also refers to a case in a woman of 35 whose symptoms had first suggested gall-bladder disease and later amœbic hepatitis. The discovery of a positive Wassermann led to anti-syphilitic treatment and cure in two weeks. Her fever was the chief symptom and showed an evening rise and a morning drop with an occasional afebrile day. During eight months of this she had lost about fifty pounds in weight. He also refers to a patient of Castaigne's whose fever had persisted for twenty months.

On the other hand, fever is not always present in syphilitic liver disease. Carnelli (*Policlinico,* 28: 1291, 1921) reports a case in a man of 22 who had had hepatic enlargement, without pain or fever, for two years. The patient denied syphilis, and yet he subsequently developed bone lesions of congenital syphilis type with a suppurating one in the shoulder, and then a Wassermann was found positive. Great improvement followed mercurial treatment.

Amœbic Abscess.—Several cases of amœbic abscess of the liver are reported. One by Brown (*California State Jour. Med.,* 19: 282, 1921) is interesting because of the secondary development of abscesses in the lungs, both right and left, without evidence of rupture through the diaphragm. The distribution of the amœbæ from the liver to the lungs must have been through the circulation unless perhaps

there was an opening at one time which closed over, but the necropsy did not seem to justify this latter interpretation. Another case, reported by Rénon and Blamoutier (*Bull. de la Société Méd. des Hôp.*, 45: 152, 1921) showed clinical cure under emetin alone.

Portal Cirrhosis.—Although it is well recognized that portal cirrhosis may occur as the result of other causes (syphilis, malaria, chronic sepsis, etc.), yet alcohol is undoubtedly the important etiologic factor in most instances. Miller (*J. A. M. A.*, 76: 1646, 1921) has been able to emphasize this relationship by a study of the effect of prohibition on the incidence of this type of liver disease in the Cook County Hospital. He finds that since 1917 there has occurred a rapid reduction in the number of admissions for this disease (1917, 156; 1918, 87; 1919, 48; 1920, 19). All but one of the nineteen admissions in 1920 were chronic alcoholics, but it was impossible to determine whether they had been able to secure alcohol after July, 1919. He therefore concludes that in this country at least portal cirrhosis is associated largely and possibly entirely with the use of alcohol. He, furthermore, points out that the sudden drop in incidence following prohibition suggests that progression of the process in the liver ceases when alcohol is discontinued.

Among 1200 necropsies analysed by Owen (*Am. Jour. Syphilis*, 5: 20, 1921) 8.5 per cent. of all the adults showed cirrhosis of the liver, and 80 per cent. of these were of the nodular type. There were three instances of typical syphilitic cirrhosis, one of obstructive cirrhosis from calculi in the common duct, and one of primary carcinoma with cirrhosis.

Riesman (*J. A. M. A.*, 76: 228, 1921) points out that cirrhosis of the liver is one of the few chronic non-bacterial visceral diseases, perhaps the only one, that may actually be cured. Even when syphilis is not a factor cure can be brought about. It is not a progressive disease, and if the ascites can be abolished the damage that has occurred seems to be compensated in such a way as to permit a virtual return to health. When the intervals between tappings are decreasing he believes the Talma operation should be performed, and he believes that the good results that sometimes follow this operation are not due merely to the establishment of a collateral circulation, but that the liver itself and probably also the spleen undergo a change. He reports two cases cured by this operation and one that recovered without

operation after having had more than 1200 pounds of fluid removed from the abdomen by tappings.

From a study of 126 cases of portal cirrhosis seen at autopsy Blumenau (*Arch. f. Verdauungs-Krankh.*, 27: 1, 1921) presents certain interesting figures as to the cause of death in this disease. In 19 per cent. only was the cirrhosis itself or its direct consequences the cause; in 19 per cent. the cardiovascular system was to blame; and in 15 per cent., arteriosclerosis. Erysipelas, tuberculosis, and other infectious diseases caused death in 26.19 per cent. and cancer in 13.42 per cent. (primary in liver in 7 instances).

Liver Insufficiency (*Hemoclasis*).—In December, 1920, Widal, Abrami, and Iancovesco (*Presse Méd.*, 28: 893, 1920) described what they believe to be a very sensitive test of heptic insufficiency. It requires only the counting of the leucocytes before and at intervals for an hour after drinking a glass of milk while the patient is fasting. With a normal liver the leucocytes remain about the same, but with derangement of liver functioning there is pronounced destruction of leucocytes during the first hour or two of digestion. They have demonstrated that some of the proteins of the food which escape complete disintegration pass through the wall of the intestine to the portal vein. Normally the liver holds back from the general circulation these proteins, but when it is diseased they pass on and exert a destructive action on the blood corpuscles, a digestion hemoclasic crisis. In various forms of liver disease the authors found the leucocytes dropping to a half or a third of the original figure. Particularly did they get this reaction after giving arsphenamin or chloroform, and they believe it to be pronounced with toxic, bacterial, or circulatory damage of the liver. It is claimed by Paguiez and Plichet (*Bull. de la Société Méd. des Hôp.*, 45: 968, 1921) that the hemoclasis can be modified by the mode of ingestion of the milk, the leucopenia which follows rapid drinking not occurring if the milk is sipped. They refer to two such cases and in both instances there occurred an actual increase in the leucocytes when the milk was slowly sipped. It is assumed that the first swallows had a protecting action warding off the hemoclasic reaction.

Galliot and Gerboy (*Paris Méd.*, 11: 205, 1921) obtained the characteristic response in four of seventeen syphilitics taking arsphenamin, due apparently to the toxic action of the drug on the

liver. Bergé, Bérnard, Guttmann, and Roberti (*Bull. de la Société Méd. des Hôp.*, 45: 184, 1921) report a definite hemoclasis following the puncture of a hydatid cyst in the liver, the leucocytes dropping from 10,000 to 5200 in ten minutes. M. and G. Girand and Parès (*Presse Méd.*, 29: 746, 1921) describe a leukæmic who had become sensitive to röntgen ray treatment and developed after each application intense nausea, general malaise, dyspnœa, dizziness and a transient hemoclasic crisis. Lermoyer (*Bull. de la Société Méd. des Hôp.*, 45: 1183, 1921) discovered that when a person susceptible to hay fever was exposed to the proper excitent, pollens or horse emanations, a hemoclasic crisis immediately occurred, before the clinical symptoms appeared.

That the liver is not entirely responsible for the production of this hemoclasis is asserted by Schiff and Stranksy (*Jahrb. f. Kinderheilkunde*, 95: 286, 1921) who secured a positive result in all the infants they tested, both the healthy ones and those with liver derangement. They found that the leucopenia developed when human or cow's milk, meat, pure peptones, carbohydrates, cod liver oil, or horse serum were given subcutaneously. Furthermore, they showed that in infants the amino-acids and products of digestion of albumin by trypsin always induced a leucocytosis, thus showing that it is not specific for albumin.

TYPHOID FEVER

Incidence.—The annual survey of the typhoid fever mortality in the cities of the United States having a population of more than 100,000 is always interesting and the ninth one (*J. A. M. A.*, 76: 860, 1921), bringing the data up to January 1, 1921, is no exception. For the first time the averages for three full five-year periods are available for comparison: 1906-1910, 1911-1915, and 1916-1920. In every one of the twelve cities having more than 500,000 population a sweeping reduction in the mortality has occurred. In the first quinquenium all had an average rate of over 10 per 100,000, Pittsburgh going as high as 65, whereas in the third only two went over 10 (Baltimore and Detroit); and for the year 1920 Detroit and Buffalo were the Newark making the best record for 1920 with a rate of 1.9 and highest, each with a rate of only 5.1. For the cities with a population from 300,000 to 500,000 there was a corresponding improvement,

Kansas City the poorest with a rate of 7.6. The average improvement for all the cities, representing a population of about 26,000,000, from 1916 to 1920, was from 8.1 per 100,000 to 3.7. In going over its accumulated data the Journal is impressed with the relative frequency of small outbreaks attributable to drinking the contaminated water of rivers, small streams or springs in public parks or recreation grounds. It would seem that education must be relied upon to prevent this mode of infection.

Vaccination.—Anti-typhoid vaccination is given the credit for the low typhoid fever death rate during the World War by all of the Allied armies, but some of the Germans maintain that it was due more especially to an improvement in sanitary measures. Banus (*International Jour. Pub. Health,* 2: 164, 1921) believes that the German skepticism results from the inefficiency of the vaccine which they used and from the fact that they never used the triple vaccine. In previous wars of the last half century the typhoid mortality varied from 11.2 to 21 per thousand troops (Ed., *J. A. M. A.,* 76: 1576, 1921), whereas in the World War it was only 0.4 per hundred thousand in the French army. Summing up a large series of statistics from numerous articles it is found that the frequency of typhoid in vaccinated and unvaccinated troops is in about the ratio of one to ten. During the first two years of the war the British records show that the morbidity record was fourteen times greater and the mortality rate forty-two times greater in the unvaccinated. After vaccination was made universal in the French army the mortality rate fell from 98.6 to 0.4 per hundred thousand. Some of the cases in the later period undoubtedly occurred in men who had escaped vaccination by fraud. In our own army of 4,000,000 men Russell has reported that between April, 1917, and November, 1919, there were only 1056 cases of typhoid and 156 deaths. In the Spanish War one typhoid death occurred among every seventy-one soldiers whereas during the World War we lost only one for each 25,641 soldiers.

That vaccination is a protection against even massive infection is attested by the report of a case by Grant (*J. A. M. A.,* 76: 514, 1921). His patient, a laboratory technician who had been vaccinated a year before, accidentally sucked into his mouth about 0.5 c. c. of a heavy suspension of living organisms. Four days later he had some headache and malise and a few days later some weakness, but no other symptoms,

and although the organisms were demonstrable in the stools on the twelfth day they could not be found subsequently and they were never found in the blood.

In further evidence of the value of vaccination are numerous reports in the French literature. Achard (*Bull. de l'Académie de Méd.*, 85 : 89, 1921) points out that only the women are having typhoid fever now. In twenty-five cases on his service in fifteen months all were women except a few youths or elderly men and one man who had a mild paratyphoid infection. Sergent (same journal, 85 : 182, 1921) states that in the last few years before the war there were twice as many male cases as female and that since there have been three times as many in females as in males. Chauffard (*Bull. de l' Académie de Méd.*, 85 : 84, 1921) brings up the question of vaccinating the civilian population, suggesting that the first vaccination should be at 15, the second at 18, and the third at 21 years of age. Vincent (same journal, 85 : 123, 1921) was able to cite instances where the non-vaccinated members of a family contracted typhoid while the others escaped. In Spain and Belgium large numbers of the civilian population have already been vaccinated.

The desirability of such a prophylactic procedure in this country is emphasized by the recent epidemic in Salem, Ohio, reported by Bunn (*J. A. M. A.*, 76 : 1159, 1921). In this city of 10,305 inhabitants 882 cases of typhoid fever occurred as the result of a pollution of the public water supply. Between the ages of 20 and 30 the incidence among the females was much greater than among the males and in explanation it was found that of the 210 ex-service men in that age group in the city only 3 developed the disease, an incidence of one in seventy, while that among the females between 20 and 30 was one in eight. All these men had been vaccinated more than two years, and this indicates that an individual enjoys a considerable degree of immunity for at least two years after inoculation. It is estimated that the monetary loss due to this epidemic amounted to $450,000.

PULMONARY TUBERCULOSIS

The Auto Urine or Biologic Test.—Following the description by Wilbolz of a biologic test for active tuberculosis in the human body by the response to intradermal injection of auto urine (*Correspondenz-Blatt f. Schweizer Aerzte*, 49 : 793, 1919) and an abstract of

that article in English (*J. A. M. A.*, 73: 456, 1919), numerous reports upon experience with the test have appeared, and while on the whole they seem favorable to the original claims they are not entirely so. In his paper Wilbolz reported upon 200 persons and stated that when there is an active process of tuberculosis the urine contains an antigen which injected intradermally induces infiltration and redness. This reaction never occurs unless there is a positive response to 1: 10,000 tuberculin and it occurs under such circumstances only when the process is active, be it in the lungs, bones, glands, or what not. The technique involves evaporating the urine 1: 10, passing it once or twice through filter paper impregnated with 2 per cent. phenol, and then making three sets of two injections on the arm, the upper pair with 1: 1000 tuberculin; the second with 1: 10,000 tuberculin; and the third with 1: 10 evaporated urine. The tuberculin response persists after the process is healed but the urine response does not. Herein lies the value of the test. The only practical objection is the tedious evaporation of the urine.

Imhof (*Schweizerische med. Wochenschr.*, 50: 1033, 1920), from Wilbolz' service, has reported further experiences with the test stating that responses were constantly negative in the non-tuberculous and constantly positive whenever there was an active process. He points out that the reaction depends upon the kidneys being capable of secreting, and when this is not the case he advises that autoserum be used.

Gibson and Carroll (*J. A. M. A.*, 76: 1381, 1921), in the first American article to appear, give their experience with this test in forty cases. All those with tuberculous bone involvement reacted positively. In all their cases in which there was definite allergy to tuberculin along with signs of activity the test was positive, and all their anergic patients with positive signs gave definite reactions when their urine was injected into allergic individuals, except in one case where there was renal impairment. In this case the autoserum was used and it was positive. Their negative results in allergic individuals bore out the opinion that these had no active tuberculosis. They do not draw any conclusions because of their limited experience but emphasize the opinion expressed by Lanz (*Schweiz. med. Wochenschr.*, April 22, 1920) who had observed the reaction in more than 300 cases and who concluded that it was the

finest diagnostic medium for the discovery of an active tuberculous focus.

Gramén (*Hygiea,* 82: 673, 1920) secured confirmatory results invariably in fifty tuberculous persons regardless of the location of the process, Alexander (*Zeitschr. f. Tuberculose,* 33: 321, 1921) in ninety-one cases, and Nasso (*Pediatria,* 29: 690, 1921) in sixty-three, fifty-three of whom were tuberculous.

Eliasberg and Schiff (*Monatsschr. f. Kinderheilk.,* 19: 5, 1920) tried the test in forty children and got results which they regard as proof of the specificity of the urine reaction, but they do not believe it to be an absolute criterion in regard to activity of the process. The most discouraging report seen comes from Offenbacher (*Zeitschr. f. Tuberculose,* 32: 355, 1921) who got unmistakably positive results in only three of twenty persons with active tuberculosis. Furthermore, Liebhardt (*Zeitschr. f. Tuberculose,* 34: 99, 1921), while confirming the specific reaction, says it is so slight and inconstant that he does not ascribe much importance to it.

Complement Fixation Test.—The exact value of the complement fixation test in tuberculosis is not yet determined but that it is an aid in some cases seems certain. Cooke (*Am. Jour. Dis. Children,* 21: 78, 1921) has performed the test 1855 times in 1556 children and claims that it not only called attention to certain cases without well-defined signs, but that it also aided in following the course of a healing lesion. He believes that a positive test is associated in a large majority of cases with a tuberculous lesion that is pathologically if not clinically active. Ichok (*Paris Méd.,* 11: 58, 1921) comments on its value in revealing the tuberculous nature of bronchitis in the elderly when the general appearance prevents a suspicion of the underlying disease. Fried and Moser (*Presse Méd.,* 29: 436, 1921) consider that by this means incipient lesions in bones, joints, glands, or lungs can be detected long before they are clinically manifest. They got positive results in 70 to 77 per cent. of sixty-eight children with known lesions of less than three years standing but only in 26 to 34 per cent. of those that were of longer duration.

Eye Sign.—As a diagnostic aid in early pulmonary tuberculosis Sergent (*Bull. de l'Académie de Méd.,* 85: 448, 1921) advises that 2 drops of 1 per thousand collyrium of atropin be instilled into each eye, when a more pronounced or more durable response in one

eye suggests apical disease on that side. He tries this when there is no spontaneous mydriasis. In 10 normals the reaction was always alike in the two eyes, in 18 cases of unilateral apical tuberculosis it was positive in 11, but negative in 3 long completely healed cases.

Phrenic Sign.—Ragot (*Jour. de Méd. de Bordeaux,* 92: 272, 1921) describes what he calls the phrenic sign for pulmonary tuberculosis, refering to a very sensitive point in the supraclavicular fossa where the phrenic nerve lies on the anterior scalenus muscle, between the two heads of the sternocleidomastoid muscle. The pain on pressure is said to be diffuse, to extend deep into the middle of the chest, and to be a very early sign of infection.

Basal Metabolism.—The basal metabolism of tuberculous patients has been studied by McCann and Barr (*Arch. Int. Med.,* 26: 663, 1920) in an attempt to develop a rational basis for the feeding of such persons, and they find it to be normal or slightly above normal. Further slight increases occur with a rise in temperature. They believe that loss in weight may be accompanied by a reduction in metabolism which more than compensates for the tendency to increase caused by the disease. While a toxic destruction of protein does exist it is not large. They conclude that forced feeding is unnecessary and probably harmful in the active stages and that since protein increases the respiratory exchange it may be well to limit its intake during periods of activity in order to put the lungs at rest. To be more specific they state that during such periods of activity the diet need not contain more than 500 calories above the basal requirement (from 2000 to 2500 calories) nor more than 60 gm. of protein. When the activity of the disease has subsided the total calories in the diet should be raised to meet the patient's requirements as his muscular activity increases.

Heredity.—As stated in an editorial of the *Journal of the American Medical Association* (76: 1768, 1921), until we have complete vital statistics, including carefully recorded necropsies on all persons who die from whatever cause, there can be no statistical evidence of value concerning the relation of heredity to either cancer or tuberculosis and for the present we must depend on animal studies. Such a study has this year been reported by Lewis of the Phipps Institute of Philadelphia, who, working with Wright of the Bureau of Animal Industry, on this subject in guinea pigs has noted in

one family a greater resistance to tuberculous infection than in any other. This resistance was an inheritable quality, transmitted by either sex in crosses with other inbred families of less resistance. The factors determining resistance did not seem to be related to other evidences of vigor. In crosses with less resistant families the offspring seemed to be more resistant than even the members of the resistant family itself, indicating the dominence of resistance over susceptibility. This work supports the impression which obtained in prebacteriologic days that heredity played a large part in susceptibility and resistance to tuberculosis, an impression which was lost sight of when the causative organism was discovered.

During the war it became apparent that certain nationalities showed a higher tuberculosis incidence than others, especially the Africans, among whom normally tuberculosis is rare, and it was argued that this disproved the hereditary factor. On the other hand, it may be held that there has been no opportunity in such a community for the weeding out of the susceptibles. Adams (*Tubercle,* 2: 145, 1921) favors the latter view, believing that the steady decline in the tuberculosis death rate is due to an acquired or heredity immunity which is steadily raising our resistance to the onset and course of the disease. In studying the records of 1000 cases he found that response to treatment was more satisfactory in those who gave a history of tuberculosis in other members of the family and especially that the children of tuberculous parents when attacked by the disease showed a greater resistance and tendency to recover.

Influence of Organic Dusts.—It has previously been pointed out by Landis, Miller, and others, that persons with pulmonary fibrosis as the result of inorganic dust inhalation do not react very acutely to tuberculous pulmonary infection, and now Gardener (*Am. Review of Tuberculosis,* 4: 734, 1921), working under experimental conditions with granite dust in guinea pigs, comes to the conclusion that, while the occurrence of tubercles is more frequent in the dusted than in the undusted lung, such lesions tend to run a more prolonged course than those in animals not exposed to dust.

Carbon Dioxide.—An interesting question in regard to the resistance to tuberculosis is raised by Cooper, Gause, and Rensch (*J. A. M. A.,* 76: 1216, 1921) who have demonstrated that 3 per cent. carbon dioxide inhibits the growth of the tubercle bacillus in the test tube and

that cultures of tubercle bacilli buried in the tissues of animals and permitted to acquire the carbon dioxide concentration of the body are definitely inhibited in their growth, while other cultures similarly buried, except that ingress of atmospheric air is permitted, show no inhibition. In view of these facts they suggest the possibility that the influence of fatigue, exhaustion, exposure and metabolic disease as etiologic factors may lie in their ability to alter the carbon dioxide content of the body.

Basal Lesions.—It is ordinarily assumed that pulmonary tuberculosis is never a purely basal condition, and yet Rosenblatt (*J. A. M. A.*, 76: 1647, 1921), in a review of 1000 records of consecutive admissions to the Bedford Sanatorium, Bedford Hills, New York, found three such cases. Lower lobe conditions were found in 18 others, but 17 of these proved to be non-tuberculous and in 2 patients old apical lesions were found in spite of negative apical signs. In two of his three cases he had occasion to observe the spread of the disease from the base upward and in the other one cavitation in the base occurred without any spread to the apices. He admits that the diagnosis is hazardous without the actual finding of bacilli in the sputum, but points out that in one of his cases extensive cavitation had occurred before bacilli were demonstrable. In the diagnosis röntgenologic evidence is of primary importance and usually it is easy by this means to rule out the lower lobe lesions that are most frequently confused with tuberculosis clinically, particularly chronic non-specific lung infections, bronchiectasis, abscess, and neoplasm. It is his opinion that if a patient presents the clinical symptoms of tuberculosis together with dullness, altered breathing, and most râles at one base and a röntgenogram shows the characteristic mottling density in that area a diagnosis is justified even if no bacilli are found in the sputum.

Gassing.— Hawes (*Boston Med. and Surg. Jour.*, 185: 1, 1921) calls attention to the need for special care in making a diagnosis of pulmonary tuberculosis in a person who has been gassed. A general appearance of robust health is against tuberculosis. The lung complications resulting from gas are usually basal and the usual signs are those of a thickened pleura and a localized bronchitis. Furthermore, in gassing there is likely to be an increase in nervous symptoms of every kind. He emphasizes the necessity of treating the man who has been gassed and not his lungs.

Treatment.—The röntgen ray has been invoked in the therapy of pulmonary tuberculosis, Wilkinson (*Am. Jour. of Roentgenology,* 8: 241, 1921) claiming decided benefit in incipient cases. He gives three treatments a week, alternately exposing the front and the back of the chest and states that the congestion is relieved, adhesions are absorbed to some extent, lymphocytes are increased, and infected lymph glands become shriveled and cease to be foci of infection. Apparently this form of treatment has not been reported upon from many other clinics and it will of course require extensive experimental work to place the above conclusions on a firm foundation.

Menthol-eucalyptus oil injected intra-muscularly in the buttox region has been used for combatting the fever of tuberculosis patients by Gerty and Cari (*Therapeutische Halbmonatschefte,* 35: 236, 1921). Of fifty patients in the second stage there were only two whose fever did not yield to the treatment, and of eighty-five in the third stage 51.8 per cent. were relieved. They gave from one to twenty-four injections of 0.5 to 1.0 c. c. of the following combination: Pure iodine, 0.1 gm., camphor, 0.5 gm., menthol, 10 gm., eucalyptus oil 10 gm., and castor oil 20 gm.

It has been found in experimental tuberculosis in the guinea pig that small amounts of morphin sulphate administered daily before and during the early part of the infection has a slightly inhibitory effect upon the development of tuberculosis in these animals while prolonged treatment exceeding five weeks after injection has no effect (Petroff, *Am. Rev. of Tuberculosis,* 5: 656, 1921).

The value of limiting the respiratory excursions in order to prevent the distribution of toxins from a diseased focus in pulmonary tuberculosis is emphasized by Sewall and Swezey (*Am. Rev. of Tuber.,* 5: 547, 1921) who recommend the application of a three inch band about the upper chest running through the axillæ. In eighteen cases they secured by this means varying degrees of improvement in thirteen. They state that it was a common experience to witness a sharp rise in the temperature curve on the day when the belt was removed and a subsidence of the fever when the pressure was resumed.

Selter and Nehring (*Zeitschr. f. Tuberculose,* 34: 1, 1921) refer to the decline in tuberculosis in Germany in the past two years and attribute this to an improvement in food conditions. Their tables showed the highest peak of mortality toward the close of winter when

the vegetables have been kept so long that their vitamin content is low. As soon as fresh vegetables come in the mortality drops and it is lowest in the fall.

ACUTE RHEUMATIC FEVER

Riesman (*J. A. M. A.*, 76: 1377, 1921) contributes an article on rheumatic fever in childhood and adolescence of such clinical importance as to warrant a somewhat detailed abstract. He points out that this disease is not, like typhoid fever or diphtheria, a unit disease manifesting itself in a more or less uniform manner, but that the rheumatic chain has a number of apparently dissimilar links, as chorea, tonsillitis, rheumatic skin affections, especially the rheumatic nodules, cerebral rheumatism, acute rheumatic polyarthritis, and rheumatic carditis. In comparison he refers to the protein manifestations of syphilis. The close connection of the latter was not clear until the spirochæta pallida was discovered, and Riesman hints that a similar discovery may yet be made in the instance of rheumatism. He refers to the work of Rosenow with the streptococcus, which he does not accept, although he thinks this organism may be an important secondary invader, as it is in scarlet fever, influenza, and smallpox.

The tonsils as an atrium for the infection is discussed, and he calls attention to the assumption that the rheumatic virus, when once introduced, no matter where that be, may survive in the tonsils, the pericardium, and the valvular endocardium after the primary attack is over, just as do the causitive agents of syphilis and malaria survive in their hiding places. So one attack does not confer immunity but rather predisposes to relapses.

The peculiarities of rheumatic fever in childhood are tabulated and include these important points: It is most frequent between 5 and 15 years, especially about puberty, and affects girls a little more frequently than boys, whereas later in life the male sex greatly predominates. The joint involvement is often slight, but involvement of the heart is very common. Tonsillitis is a frequent preoccurrence in the attack and is a common antecedent in the patient's history. Chorea is a sequel in a number of incidences. Skin manifestations are more common than in adults.

In reference to the heart, he states that cardiac involvement may occur within twenty-four hours after the beginning of the disease, and

that aortic involvement, while perhaps not so common as mitral is nevertheless much more frequent than is indicated in textbooks. Mitral endocarditis is capable of complete recovery, though mitral stenosis may be a delayed result of a mild and apparently evanescent lesion. On the other hand, aortic lesions very rarely disappear. Double valve involvement usually means two separate attacks. Pericarditis is very common but is often overlooked because it is usually painless and it does not always produce a to-and-fro friction sound. The myocardium probably never escapes involvement entirely. In cases with marked cardiac involvement nodules sometimes appear in the skin, chiefly about the elbows, back of the wrists, near the ankles, and over the buttocks.

Riesman believes in large doses of the salicylates during the first twenty-four hours (6 to 10 gm.), decreasing it after that. He admits that the use of vaccines is purely empiric, but thinks that rarely a stock vaccine is beneficial, "perhaps as a foreign protein rather than because of any specific substance." If the tonsils are diseased they should be removed, but this should not be done during an acute attack. He considers tonsillectomy of less value in warding off a recurrent attack of chorea.

Rheumatic fever and scarlet fever of all the common diseases of childhood are most to be dreaded, says Riesman, because of their treacherous nature. While they do not often kill they frequently maim for life.

Poyton, Paterson and Spence (*Lancet,* 2: 1086, 1920) at the Hospital for Sick Children, Great Ormond Street, London, made a study of 172 cases in children under 12 years of age during a severe outbreak. In 40 per cent. there was a hereditary tendency. Nearly 13 per cent. died and 17 per cent. became complete invalids, while 66 per cent. showed some heart lesion. All the deaths but one were due to carditis. The fatal cases most frequently commenced with an acute arthritis, rapidly followed by carditis. Emphasis is placed on the association of severe stiff neck with serious heart disease. They state that chorea was the most frequent solitary manifestation of the rheumatism.

Riesman's impression as to the frequency of aortic valve involvement in the rheumatism of children is borne out by the statistics given by Nobécurt and de Toni (*Presse Méd.,* 29: 733, 1921) who

found it in 39 per cent. of 33 cases, including 4 each of scarlet fever and chorea. Neither the scarlet fever nor the chorea cases, however, had aortic lesions, and if these are subtracted from the total it shows that 50 per cent. of the rheumatism cases had such involvement. With the aortic disturbances predominating they found the prognosis comparatively benign, while with mitral lesions predominating the outcome was less favorable. In 4 of 7 children with aortic endocarditis from recent rheumatism there were no symptoms to call attention to the heart; only the physical signs revealed it. In these cases in children the left ventricle is hypertrophied, there is usually precordial bulging, and the apex beat is violent.

Michels (*Zeitschr. f. Tuberculose,* 33: 279, 1921) reports a case of what seemed to be acute articular rheumatism developing in the course of pulmonary tuberculosis in a man of 32. As the pulmonary disease improved the rheumatic phenomena retrogressed and there was no recurrence during the subsequent two years.

Confusion of the disease with post-scarlatinal polyarthritis is discussed by Van Amstal (*Jahrbuch f. Kinderheilk.,* 95: 186, 1921) who reports a case of the latter in a girl of 10 who had had an unrecognized scarlet fever five weeks before. He gave in this case a polyvalent anti-pyogenic vaccine with much benefit.

The comparative therapeutic efficiency, toxicity, and renal functional effects of cinchophen, neocinchophen, and novaspirin in rheumatic fever is reported upon by Hanzlik, Scott, Weidenthal, and Fetterman (*J. A. M. A.,* 76: 1728, 1921). They found novaspirin to be therapeutically useless. Cinchophen gave partial relief from symptoms with doses of from 3 to 6 gm. and complete relief with doses of from 10 to 13 gm., while neocinchophen required a somewhat higher range of dosage. Large doses of these drugs produced the characteristic symptoms of salicylism ("toxicity"), which, however, were less pronounced than those caused by corresponding doses of salicylate. Cinchophen differed from salicylate by causing epigastric pain, by its local irritating action, but neocinchophen did not. (Both cinchophen and neocinchophen in large doses slowed the pulse rate of febrile patients by a direct depressant action on the circulation. Both were somewhat injurious to the kidneys, cinchophen the more so, producing albuminuria, occasionally casts, and a diminution in the excretion of phenolsulphonephthalein. Finally, they conclude that, as

compared with salicylate, cinchophen appears to be about equally efficient, while neocinchophen is somewhat less so. The symptoms of "toxicity" are about the same and renal injury somewhat less after cinchophen, and both the "toxicity" and the renal injury are less after neocinchophen than after salicylate.

CHOREA

That chorea is due to an infection is manifested clinically by the frequency with which it follows tonsillitis and acute rheumatism and by its association with endocarditis. Furthermore, it has been produced experimentally in animals by the intravenous injection of streptococci. Floyd (*Jour. Med. Research,* 41: 467, 1920) found a much higher percentage of carriers of certain types of virulent streptococci in the tonsils and about the teeth in cases of chorea than in normal controls. Yerger (*J. A. M. A.,* 76: 166, 1921) now reports a case of eighteen months standing in a girl of 15 years which cleared up within a week after removal of the tonsils and adenoids. The tonsils were apparently not certainly diseased, but there was a pus pocket between the lateral halves of the adenoids. Mollen (*Colorado Med.,* 18: 47, 1921) concludes that the disease is the result of the general toxic blood state or of the local action of a microörganism in the cerebral cortex and that this organism is closely allied to or a development of the organism causing rheumatic fever. He too believes that local infections are to be considered seriously in all cases but thinks that operative measures, especially on the tonsils, should be deferred until the acute period of the disease has passed, as manipulation is likely to be followed by an exacerbation of symptoms with implication of the serous membranes. The most effective medical treatment consists in the use of the salicylates, increasing the dose until the physiologic effects are produced. He considers arsenic of value only for its effect on the associated anæmia.

Riesman (*J. A. M. A.,* 76: 1377, 1921), on the other hand, does not consider the salicylates of value in chorea, but takes the occasion to point out that this fact does not indicate to him that this disease is unrelated to rheumatism, for he remembers the different behavior of tabes and skin syphilis to mercury and arsphenamin.

Morquio (*Arch Españ. de Pediatría,* 5: 84, 1921) reports several interesting cases in a series of 15, in none of which could syphilis be discovered. Two of his female patients had recurring attacks but never had any rheumatism or heart disease. In a boy of 11 a very severe attack was followed by febrile epidemic encephalitis. In three others a chorea of unusual severity with stormy onset yielded to a paralytic condition with fever, fatal in one or two months. Necropsy revealed a diffuse encephalitis.

Berger (*Am. Jour. Dis. Child.,* 21: 447, 1921) examined the blood of forty children with chorea for eosinophiles and found an average of 7.6 per cent., the individual figures ranging from 0 to 26. He discusses the possible significance of this finding.

The benefit derived from isolation of a child with severe chorea is due, according to Karger (*Jahrb. f. Klinderheilk.,* 95: 261, 1921), to the avoidance of the depression which the child experiences when it realizes its inability to do properly the things which others are doing. He believes the muscles can be trained to normal functioning by special movements, exercising a certain muscle while excluding others, and at the same time keeping the child's interest aroused and stopping at the first sign of fatigue. He advises making the exercises into a sort of game and that they be performed slowly. Various exercises are described. No drugs are given. He reports a number of cases cured in this way, one being of three years standing.

ERYTHEMA NODOSUM

Evidence continues to accumulate indicating a relation between erythema nodosum and tuberculosis. Stokes (*Arch. of Dermat. and Syphilology,* 3: 29, 1921) reports a case which terminated in tuberculous meningitis. The outstanding features of interest were: (1) Absence of clinical evidence of tuberculosis when the patient presented herself with rheumatoid symptoms and erythema nodosum. (2) The apparently exact correspondence of the onset of the skin lesions with the generalization of the tuberculous infection as estimated by the age of the tubercles found at necropsy. (3) The complete absence of the septic foci responsible for erythema nodosum of the streptococcal or Rosenow types.

Vetlesen (*Norsk Magazin for Lægevidenceskaben,* 82: 689, 1921) found that 13.3 per cent. of his 45 patients with this disease developed

tuberculosis and it was suspected in enough others to bring the percentage to 26.6. On the other hand, 5.1 per cent. of his 350 cases of pleurisy had had erythema nodosum at some previous time, and 6 per cent. of 1317 tuberculous patients.

Ernberg (*Jahrbuch. f. Klinderheilk.*, 95: 1, 1921) reviews eighty-six hospital cases in children in addition to a number of private patients, and is convinced that the disease is the manifestation of an anaphylactic process in the glands connected with the lungs; he states that it may escape detection without röntgen examination. The lesions resemble those induced artificially by the tuberculin test. The benefit derived from tuberculin treatment he considers to be further evidence of his view, as well as the resemblance of the lesions to other known superficial processes of an anaphylactic nature. In this light erythema nodosum may be looked upon as an indicator of tuberculosis elsewhere.

ARTHRITIS

The etiology of many cases of arthritis is still obscure. While the bacterial origin of certain types is unquestionable there is evident no general tendency in the literature of the past year to accept unqualifiedly the position that all varities can be so explained.

In a study of three hundred cases at the United States Base Hospital, Camp Lewis, Washington, Harding (*Calif. State Jour. of Med.*, 19: 26, 1921) found in 89 per cent. some infectious process other than that in the joints themselves. The blood cultures were all negative. Streptococci were found in about the same proportion as they were in the throats of the hospital patients generally, and he is not convinced that the organisms found in teeth and tonsils were the sole causative factors. There were no gastrointestinal diseases demonstrated, not even an appendiceal or gall-bladder infection. About 25 per cent. were admitted with a diagnosis of gonorrhœal rheumatism, though gonorrhœa was found in only 9 per cent. Monarticular gonorrhœal infection was rare (2 or 3 per cent.).

Of seventy-three infants with acute arthritis studied by Johnson (*Am. Jour. Dis. Child.*, 21: 170, 1921) only thirty-two gave a history or showed on examination any definite source of infection. Pneumonia was a possible source in ten cases, naval infection in four,

furunculosis in three. The streptococcus was responsible in eighteen, the pneumococcus in fourteen, and the gonococcus in seven.

Plisson and Brousse (*Lyon Chirurg.*, 17: 705, 1920) have compiled 185 cases of pneumococcus arthritis, but in only 26 cases was the arthritis primary; 14 were in children.

Treatment.—Eradication of existing foci of infection holds first place in the treatment of the obscure types of arthritis, but this so often fails to give relief that numerous other measures must be kept in mind and made use of. Lampronti (*Riforma Medica*, 37: 225, 1921) has experimented with different drugs injected directly into the joints, and his best results were obtained with 8 c. c. of a 3 per cent. solution of antipyrin. He claims that the temperature drops in a few hours while the pain ceases at once as if by magic. The absorption of œdema around the joint rapidly follows. Unfortunately in some cases other joints flare up as the treated ones subside, and so he usually distributes about 12 c. c. more of his solution among the other affected joints.

Netter (*Bull. de la Société des Hôp.*, 45: 573, 1921) recommends the injection into the joint of a non-specific antiserum when the causative organism cannot be determined; when it can be, he uses specific antiserum.

Lambert (*Med. Soc. State of N. Y.*, abstract in *J. A. M. A.*, 76: 1604, 1921) discussing the drug treatment recommends for intestinal disinfection phenol combinations with betanapthol, salicylic acid, or cerium oxalate. From 3 to 6 lemons a day with sodium bicarbonate are valuable, he says. Acetyl salicylic acid in 3 gm. doses is advised for the relief of pain. Lead acetate dressings are helpful. As to diet he restricts the purins and carbohydrates but maintains nutrition.

For gonococcus arthritis Dufour and Debray (*Bull. de la Société des Hôp.*, 44: 1399, 1920) inject subcutaneously fluid taken from the diseased joint. They claim that the general symptoms and the general and localized pain rapidly subside, and that the temperature gradually declines.

Cowie (*J. A. M. A.*, 76: 310, 1921) discusses non-specific intravenous protein therapy and says that acute or subacute processes that have not progressed beyond the first year give the best results, that a few cases of as long as three years' standing have been benefited, and that benefit has occasionally resulted even in the more chronic

forms. As contraindications to this form of treatment he gives uncompensated cardiac lesions and acute endocarditis or pericarditis.

Secondary proteose is believed by Snyder and Ramirez (*Arch. Int. Med.*, 28: 50, 1921) to give rise to less nausea, headache, and weakness when injected intravenously in these cases than do the typhoid vaccines which are more generally used. So far as relief of pain and improvement in the joint conditions is concerned, they seem to act similarly. In their series they got results from small doses of foreign protein when there had been no relief by the more usual forms of treatment. The benefit is nearly always greatest in the joints of the upper extremities. Waggoner (*Ohio State Med. Jour.*, 17: 628, 1921) states that in acute infectious cases there is marked improvement and cure in 50 per cent. after from one to five injections of 20 to 50 millions of dead typhoid bacilli given each third to fourth day, and in his cases there have been no complications. Ten per cent. of the chronic cases are made practically normal, 20 per cent. are improved, and 10 per cent. remain unchanged.

Progress of Surgery

For the Year 1921

By JOHN SPEESE, M.D.

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FRACTURES

In discussing the non-operative treatment of fractures, Cutler (*Annals of Surgery,* 1921, lxxiii, 91) states if there is any one branch of medicine in which the recent experience gained by observation of battle casualties has been of distinct value it is that concerned with the care and treatment of fractures. That experience, which by force of circumstances was enormous, brought out certain principles of treatment that are applicable to civil fractures whether compound or not. The chief lessons learned were: (1) The success of mobilization in the treatment of infected joints, and (2) the value of traction in the care of fractures generally.

To those to whom the war gave the opportunity to study fractures in vast numbers, the results obtained by traction at first seemed almost marvelous, especially when the simplicity of the method was appreciated. It was soon found that traction in the direction of an extremity would in almost every instance, if of sufficient amount, bring displaced bones into alignment. Accessory padding or lateral pulls were unnecessary, since fascial planes and neighboring muscle bellies, when made taut, soon brought the displaced fragments into alignment, no matter what the deformity. It is doubtless true that in the battle casualties considerable bone was often lost, so that this might be considered as making the realignment of fragments more easy to obtain.

A further observation, by no means new, but now perhaps best emphasized, was the malleability of callus at late periods. Thus, a badly deformed fracture of the femur as late as three weeks or even longer, and with visible callus formation and shortening, if submitted

to sufficient traction could be pulled down to full length and good alignment obtained.

It is Hartwell's (*Arch. of Surg.*, 1921, iii, 595) belief, that with proper attention, practically every fracture through the middle third of a long bone can be successfully treated by the traction suspension method, and that the results will be more promptly obtained and better functionally than by other methods. He has found the principles of this method sound and their application possible with this type of fracture. It must be emphasized, however, that the application is often beset with difficulties, and that patient, untiring effort will alone be rewarded with success. It is a method that can be applied only after considerable experience, and with attention to detail that many surgeons are unwilling to give. Its success, therefore, depends on the opportunity to see and treat a considerable number of cases, coupled with a recognition of the fact that the expenditure of time and care will bring a satisfying reward.

As a result of his experience, he finds only very exceptionally a fracture in the middle third of a long bone which cannot be successfully treated by the traction method. Every fracture is made an emergency case in that its treatment is immediately undertaken on admission. A preliminary röntgenogram is taken. The method of applying traction in fractures of the femur is by means of the ice tongs, and suspension is obtained by the Thomas splint and the Balkan frame. In an adult male, the initial weight applied is 25 pounds or more. This is reduced when the röntgenogram indicates that it is possible. It cannot be overemphasized that the immediate application of sufficient weight to overcome the shortening is all important. Over-pull is preferable to under-pull. Too little weight at first results in a fixation of the injured muscles in a shortened condition, and necessitates later a far greater weight than would have been initially needed. The suspension is done in the recognized way, so that active and passive motion (by means of pulleys) of both the hip and knee are at once begun. In humeral fractures, the traction is obtained either by adhesion to the skin or by means of the Henniquen band around the flexed elbow. From five to eight pounds is sufficient, and either method will support this without difficulty. The suspension is by means of a specially constructed addition to the Balkan frame, which permits traction at any angle with the

trunk. Fractures in the shaft of the leg are usually drawn into direct alignment without difficulty. Occasionally, however, badly comminuted fractures show a persistent deformity which can be readily overcome by tong traction on the malleoli or os calcis, or by the Henniquen band if low, or skin traction if high. Success with the Sinclair skate has not been satisfying.

What has been stated concerning our satisfaction in this method of treating fractures through the middle third of the long bones, cannot be said with the same degree of satisfaction concerning fractures near the large joints. However, our experience here leads us to believe that further study will overcome the difficulties we have encountered, and we are satisfied that in the end such fractures will yield a higher percentage of good results by this method than by any other.

It must be emphasized that a perfect anatomic repair of a bone, accompanied by a badly crippled joint, is far more disturbing to the patient than a poor position of the fragments with a well functioning neighboring joint. In many cases a proper reposition of the fragments has proved impossible. Nature, however, has responded more than satisfactorily in her ability to reëstablish a range of motion in the joint which permits of all essential activities.

There are certain compound fractures of the tibia and others in which the displacement is very irregular, such as the long oblique much displaced type, or fracture of the lower third with much malalignment. This group, Moorhead (*Amer. Jour. Surg.*, 1921, xxxv, 133) designates as "irreducibles" and formerly operation was necessary and coaptation accomplished by some form of suture, wire, screws, bands or plates. The use of non-absorbable materials has justly fallen into disfavor because of their danger as to life and limb, their tendency to cause non-union and osteomyelitis. Moorhead has not found it necessary to plate or wire a fracture in a decade, and this form of treatment is not needed if for it is substituted skeletal traction, by means of nail, tongs, or stirrup. Of these forms of skeletal traction, the tongs or stirrup are most useful in leg fractures, and the nail in femur fractures. There is little or no danger of bone infection and the skin infection is negligible. When union is firm, the traction appliance is removed, the two-piece plaster-of-Paris antero-posterior splint is substituted, or the "walking

calipers" is employed. Under this form of treatment non-union should be less frequent, deformity will be lessened and joint stiffness minimized.

In analyzing the results of treatment of 115 cases of fracture of the femur Eliason (*Annals of Surg.*, 1921, lxxiv, 206) found in patients under eight years of age the Bryant or perpendicular treatment gave the best figures, 85 per cent., excellent, or 100 per cent. good results. In this group all results were reported as good.

In the eighty-eight cases ten years of age or older the primary reduction and dressing was not satisfactory in a single case.

A small group of eight cases later set in plaster under traction, all showed shortening or non-union.

The next group of twenty cases dressed in the flexed position with weight traction gave 25 per cent. good results with no deformity.

In operative cases infection occurred in none of the drained wounds. Every case, however, showed slight infection around the Steinmann nail.

Internal fixation failed to hold the fracture in twenty-one of fifty-four cases. Causes of this failure were in the greater number of cases due to the position, in which the limb was splinted, twenty being dressed in the flat position, and to a much less extent to infection, only three cases.

Non-union, or better, union delayed longer than seven weeks, was most often due to faulty fixation of the fracture, and occurred in 22.2 per cent. of the operative, 0.86 per cent. of the non-operative and 10 per cent. of the entire series. It is hardly fair to include these figures as other than undetermined, as they have not been heard from finally.

Operation gave 81.6 per cent. good results; non-operative methods gave 73.9 per cent. good results in the entire series of 115. It must be remembered, however, that this last figure is helped enormously by including the twenty-four youngsters with 100 per cent. good results.

Of the operative procedures, the use of plates and screws with wound drainage and the limb dressed in plaster, in flexed position, with post-operative traction maintained, gave 90 per cent. perfect results, plus 10 per cent. good. All other operative methods gave but 33⅓ per cent. perfect results plus 33⅓ per cent. good results.

Plaster castings are not a good permanent dressing unless trac-

tion is used and the case kept under close observation until union is firm and especial care being taken as shrinkage of the limb occurs, a new cast be applied. This last is very important, for if there is too much room in the cast at the fracture site, each time the patients raise themselves in bed the psoas muscle acting against the fracture will loosen the internal fixation. If these precautions are taken, however, plaster makes an excellent dressing if cut out so as to permit knee and ankle motion.

From the above facts we see that the best treatment was operation with plate fixation and drainage and the same amount of attention given to external fixation, flexed position and traction as would be given were the case treated by the closed or non-operative method.

Fractures of the femoral diaphysis in children over 4 or 5 years of age treated in a proper Balkan frame and suspension splint traction, yield good results according to Speed (*Surg., Gyn. and Obstet.*, 1921, xxxii, 527). This method gives constant and efficient traction in the axis required against contracting muscles.

There is no pain if the skin surface does not become cut and infected and a traction weight proportionate to the child's body weight is used.

The patient has bed freedom to amuse himself, to use the bed pan to permit nursing attention.

A maximum length and good axial alignment can be obtained by this method if care is given to watching details.

Splints permitting knee movements during traction can be used. Most children do not need them. They recover quickly from any knee stiffness acquired during the 4 weeks of traction.

The usual result is much better than a result obtained by any other non-operative method.

When the children are younger than 4 years, the patient's total weight as compared to his limb's weight is insufficient to insure a satisfactory result by suspension traction in a Hodgen or Thomas splint. The patients are not tractable and will twist about too much. Any operation, even the insertion of calipers into the femur, is contra-indicated for the 2- and 3-year olds. We recommend overhead extension of both legs at the same time for these little people.

The most important controlling factor we reserve for the last. That is the use of the portable X-ray tube for control of the position

gained by traction. The röntgenograms should be made within 48 hours after the leg has been established in suspension traction. When the traction is insufficient, when bowing or angularity or incorrect axial relation exists the plate shows the error and simple steps taken early in the course of healing may bring perfect results. Splints may be bent and weights adjusted to fit each patient. Don't put off taking the röntgenogram until callus has formed which is too strong to prevent the corrections necessary for a happy outcome.

BONE

The recognition of central isolated bone abscesses has received scant attention in the opinion of McWilliams (*Annals of Surgery,* 1921, lxxiv, 568), who summarizes his observations as follows:

Given a tender swelling of a bone in which traumatic periostitis, cyst, new growth and syphilis (negative Wassermann) can be ruled out, when associated with intermittent night pains, such swelling should always be explored and the medullary cavity opened. The soft parts should then be closed over the cavity except for space sufficient to allow Carrel's tubes to be inserted. Dakin's solution should then be used through the tubes every two hours until smears show an absence of organisms, when the cavity can be completely closed with confidence that the wound will promptly heal without a sinus forming.

In acute hæmatogenous osteomyelitis Bancroft (*Annals of Surgery,* 1921, lxxiii, 681), has found that operation with removal of only sufficient cortex to allow adequate drainage followed by thorough post-operative Dakinization, will frequently preserve the remaining cortex, often seemingly dead. Moreover, deformity may be prevented and the period of disability shortened. Care must be taken to avoid injury of the blood supply by unnecessary curettage and packing. Animal experimentation in chemically produced osteomyelitis suggests the possibility that any necrotic bone, if sterile, will eventually be utilized as a framework for new bone production. From the experience obtained clinically and from many animal experiments, the writer is convinced that in the future in the treatment of children, we can be more conservative.

Allison (*Arch. of Surg.,* 1921, ii, 593) in investigating fifty cases of bone tuberculosis concludes that tuberculosis may involve any portion or tissue of the bony framework of the body.

Tuberculosis is by far more frequently localized in the ends of the bones, and as a consequence, generally involves a joint or joints.

The pathologic process is to be regarded as not essentially different in its manifestations wherever it may occur. If tissues are involved that possess the property of rapid proliferation when infected, this process will be observed when the tubercle bacillus is the agent. If tissues are involved which do not rapidly proliferate under infection, destruction will be observed when the tubercle bacillus is the agent.

It is cumbersome, confusing, and in a sense wrong, to describe the process of tuberculosis separately, as it affects bone tissue of various types and joint structures. It is all one and the same. The variations are due only to the characteristics of the tissue infected.

It is also unwarranted to classify this disease as to the type of reaction observed, as search will reveal most types of process in practically any well-established lesion. The writer is opposed to the terms employed in the older literature as classifications, such as infiltrating, atrophic, caseous and hypertrophic tuberculosis of the bone. This is especially true of such descriptive terms as "chronic synovial tuberculosis" and "fungating" or "granulating tuberculous synovitis." Here the observer has described one phase of a tissue reaction as a pathologic and clinical entity.

The observations on this series of fifty cases incline the writer to believe that the disease is primarily osseous, and that the disease may occur more frequently than is generally believed in the regions of the skeleton away from the joints, and that this fact should be emphasized in the teaching of the characteristics of this disease.

CANCER OF THE LIP

A study of the end results of operative interference has been made by Sistrunk (*Annals of Surgery,* 1921, lxxiii, 521). In the first group of cases, in which the primary lesion was excised and the glands retained, but not involved in metastasis, 90.3 per cent. of the patients were alive from five to eight years after operation.

In the second group of eleven cases, in which the glands were involved at the time of operation, only two, 18.1 per cent., were alive five years after operation.

In group three, comprising 27 cases, in which the growth only was excised, on account of the age or physical condition of the patient, there were 79.2 per cent. of cures after five to eight years.

A review of these cases shows that the percentage of cures following operation in cases in which the glands are involved is much lower than in cases in which operation was performed before the glands became involved. The percentage of from five- to eight-year cures when the glands were involved is almost identical with that obtained in cases of cancer of the breast when the glands are involved. The percentage of local recurrences seems too large. This probably could be avoided to a certain extent by a wider removal of the growth and the use of radium after operation. Rapidly growing epitheliomas, and especially those growths with a marked inflammatory reaction surrounding them, are best removed with the actual cautery without attempting to perform a plastic operation at the time. In cases in which the glands have liquefied, broken down and extensively involved the surrounding tissues no relief can be expected. Such cases are probably best treated by means of radium and X-ray.

Treatment of the growth by means of radium and the X-ray without removal of the glands does not seem a radical procedure, as there were a number of patients with an extension of the malignancy later into the glands while the primary lesion remained cured. There is no doubt that radium often destroys the growth, but such a procedure is almost identical with the methods in which the growth is removed with pastes or by local excision. We know from experience that although there may be no local recurrence of the growth following the latter procedures, in about from 20 per cent. to 30 per cent. of the cases, metastasis occurs later in the submaxillary and submental glands.

In considering operations for cancer of lip or jaw, particular attention is directed by Cole (*Lancet,* 1921, cxcix, 845) to the necessity of restoring function and to the prevention of deformity following such operations. He condemns the V-shaped excision of the lip because there have been a high number of local recurrences following this method. In every case of cancer of the lip, the submental, submaxillary and upper carotid lymph-nodes should be removed on both sides of the neck in order to prevent recurrences in these situations.

CANCER OF THE TONGUE

The danger of delay in the proper treatment after onset of the malignant lesion reduces the chances of a cure in operable cases from 62 to 12 per cent., according to Bloodgood (*J. A. M. A.*, 1921, lxxvii, 1831) and increases the chances of post-operative death from 5 to 30 per cent. Further delay means an inoperable condition for which, at present, we have no treatment that promises a cure. Educational propaganda has increased the number of operable cases from 53 to 80 per cent., and decreased the number of hopeless and inoperable cases from 47 to 20 per cent.

The guiding rule should be not only the early recognition of cancer of the tongue, but the recognition and appropriate treatment of the benign lesions which precede cancer by months or years, and the recognition of the cause of these lesions–tobacco and irritating teeth.

The message to the people is short and simple, but the message to the medical and dental professions must be in great detail, because if the people seek advice early, the profession must be prepared to recognize the early precancerous stage or the earliest stage of cancer when diagnosis is difficult and proper treatment simple.

RÉSUMÉ OF THE EDUCATIONAL PROPAGANDA

It is strange but true that surgeons for years have been content to employ the tedious, difficult operative treatment of cancer when they knew that their operative mortality was high and their permanent results low. Surgeons must have concluded for years that the ordinary patient, without specific information, rarely, if ever, sought advice in the precancerous stage, and seldom and accidently in the earlier and more favorable operative stage of malignant disease.

Quick (*Annals of Surgery,* 1921, lxxiii, 716) from his study concludes that the primary lesion in cancer of the tongue should be managed entirely by the use of radium. The use of buried emanation in weak tubes uniformly disturbed throughout the growth is by far the method of choice in applying the radium. The cervical nodes should be treated conservatively: First, by external radiation where the neck is free from palpable involvement, and then, should metastases appear, the treatment of these should be by external radiation, followed by a complete neck dissection under local anæsthesia, coupled

with the use of radium emanation in very weak tubes buried throughout the wound.

While the time factor is still too short to permit of comparison with surgical statistics, he feels convinced that this form of treatment in unselected cases will yield a higher percentage of clinical cures than will surgery alone in the selected operable group.

GASTRIC AND DUODENAL ULCER

For practical purposes Wilensky (*Annals of Surgery*, 1921, lxxiii, 420) divides chronic ulcers of the stomach and duodenum into one of two types: The first of these—and perhaps, the less important—are the soft lesions characterized (1) by their relatively smaller size, (2) by their superficial extent, (3) by the failure of the process to penetrate any deeper than the submucosa, (4) by the absence of surrounding areas of induration; noted (5) by the frequently greater benignity of the clinical course, (6) by the tendency to undergo malignant transformation, (7) by the frequency with which cures are obtained with medical means alone. The second are the lesions characterized (1) by their comparatively larger size, by the deep penetration and frequent perforation, (2) by their marked induration and by their numerous dense adhesions to surrounding organs, especially to the pancreas; (3) by their marked chronicity and frequent "relapses"; noted (4) by the frequency with which malignant changes are found throughout the lesion or limited to its bed or margin; (5) by the tendency to complications of a mechanical nature accompanying their progression. There are cases, however, in which the characteristics of the one overlap into those of the other, or in which a proper distinguishment of the lesion is made difficult or impossible because of many associated phenomena frequently of a functional nature.

The general opinion that the great majority of gastric and duodenal ulcers can be cured by medical means alone and can be kept cured under proper after-treatment is susceptible to some modification and is properly applicable to cases in the first group only—that is, the soft ulcers. The further opinion that most medical men push the matter of medical therapy too far and that an ulcer persisting after proper medical treatment becomes a surgical malady is one which necessarily must also be modified in view of the newer

knowledge regarding ulcer and its manifestations and complications. In the cases in the first group mentioned, when there are no complicating factors present in addition to the general and ordinary manifestations of ulcer, medical treatment should be persisted in alone. When stasis in the stomach is well established and the drainage of the organ is unsatisfactory, then surgery is indicated without any unnecessary waste of time to restore the emptying power of the stomach to its normal condition; the important point to remember is that the surgical means employed to secure this improvement in drainage should be one which will not disturb the anatomical arrangements and relationships of the stomach, or if it necessarily must do so, that the procedure be done in such manner as to permit at some subsequent time, if it prove necessary, the restitution of the organs to their normal status; this refers especially to the operation of gastroenterostomy.

The appearance of certain other complications also indicates the necessity for surgical interference: These are (1) repeated hemorrhages and (2) cicatricial deformity of the stomach either at its outlet (pyloris stenosis) or in its body (hour-glass deformity).

When a large crateriform lesion is demonstrated by the röntgen-ray surgery is absolutely essential because of the following considerations: (1) The knowledge that such lesions practically never heal spontaneously; (2) the danger (18 per cent.) of malignancy; (3) to prevent deformity of the stomach; and (4) to prevent any irreparable damage to the functions of the stomach both on the motor and chemical sides.

Mayo (*Annals of Surgery,* 1921, lxxiii, 328) concludes that if it is true that there is an average duration of a number of years in the majority of cases of duodenal and gastric ulcers, many extending from twenty to thirty years, it is probable that there is an exaggerated idea of their danger to life. Acute perforation is a serious danger, which is greater when it occurs as a primary symptom of ulcer. Subacute and chronic perforations are frequently noted at operation. Extensive hemorrhage may also cause death. While few persons die from these conditions the number is greater than the number of those who succumb from surgical measures, which, if instituted in time, should restore the patient to health and activity. It is true that patients suffer, are disabled and should be relieved, and it is also probable

that but a small percentage of the total number of ulcers are early recognized and treated for the true condition. Gastric ulcers may give greater discomfort than duodenal ulcers, and because of the danger of malignant degeneration should be destroyed at the time of operation unless this procedure would add unwarranted immediate risk. Mayo believes patients who have gastric ulcer should be informed of this danger. While blocking the pylorus has been recommended in addition to gastroenterostomy and practiced, the procedure was unnecessary and is now obsolete. In the surgical treatment of ulcer we have applied a well-known principle of agriculture: An acid and continuously wet soil is tile-drained and its surface limed.

In fact, the surgical treatment of ulcer is the best recognition of the value of medical treatment in permanently overcoming delay or obstruction and lowering the acidity with the patient's own alkalies.

In advocating gastroenterostomy in acute perforated ulcer of the stomach and duodenum, Deaver and Pfeiffer (*Annals of Surgery,* 1921, lxxiii, 441) are certain that the mortality of acute perforated ulcer is not increased by simultaneous gastroenterostomy provided it is done quickly, and not attempted in cases obviously shocked. They have, moreover, a distinct impression that the operation has given a lower primary mortality not only in the hands of those who use it routinely, but with those who employ it only occasionally for more narrow indications, and then explain their lowered mortality by saying that it was done only in selected cases.

There has been much talk on the subject of the dangers of infecting the lesser peritoneal cavity by opening the transverse mesocolon for the performance of gastroenterostomy. But no one seems able to report a case in which there is good reason to believe that this has occurred, and moreover, as pointed out years ago, and since verified by others, much of the exudate that is poured out so richly in these cases is in reality sterile or relatively so, being a response to the chemical irritation of the gastric and duodenal contents rather than the result of bacterial inflammation. In this series there were thirty-four cultures of the fluid in the peritoneal cavity which were sterile in twenty-three cases and positive in only eleven.

Another point which has always seemed strange is the denial by the antagonists of the operation that gastroenterostomy possesses either a favorable early or late influence upon those patients admittedly the

subject of the disease for which gastroenterostomy is acknowledged to be the cornerstone in treatment. A surgeon whose mind works in this peculiar fashion would never think of operating upon an ulcer in the pre-perforative stage by simple suture without gastroenterostomy. Yet the moment a spontaneous perforation has occurred, however small or large and wherever situated, he feels that the ulcer has now demonstrated that it is on the high road to recovery provided it has not succeeded in giving the patient a fatal peritonitis.

The weighty arguments of special nature are:

(1) That the morality in unskilled hands will be increased by the addition of gastroenterostomy. (2) That even in the best hands gastroenterostomy will certainly raise the death-rate when used in desperately sick cases, whether early or late. To both these assertions we agree. Unless the surgeon is able to make the anastomosis quickly and with irreproachable technic simple suture is the safer operation. But let us not cloud the situation by pretending that the patient so treated as an emergency is as likely to remain free from ulcer symptoms or complications as if he had been given a gastroenterostomy as well.

It is not wise to insist upon making a gastroenterostomy in the presence of shock or evident systemic toxæmia. These cases are not numerous within the first twelve hours after perforation, but they do exist. The importance of gastroenterostomy as a primary procedure is not so great as to warrant accepting obviously increased operative risk. That it does not increase the primary mortality in properly selected cases we consider to have them demonstrated. On the contrary, there is good reason to believe that it promotes convalescence and actually diminishes mortality. Accumulating statistics and more accurate follow-up records are dispelling the fallacy that perforation cures ulcer, and tend to show that primary gastroenterostomy lessens the liklihood of future ulcer symptoms and complications.

The results of operation in the cases of secondary ulcer have been reasonably satisfactory, according to Judd (*Surg., Gyn. and Obstet.*, 1921, xxxiii, 120), especially since the importance of dispensing, whenever possible, with the gastroenterostomy. If a secondary ulcer has once formed after gastroenterostomy it is surprising how many will continue to form if the anastomosis is maintained in these patients who seem to have some definite irregularity or specific infec-

tion. In a few instances he has observed such repeated occurrence in spite of the fact that alkalization and systemic post-operative management were established and kept up from the time of the operation. Ballance mentions two cases in which alkalies did not prevent the occurrence. Nevertheless, he believes that proper management during the healing of the tissues following gastroenterostomy and for some time afterward offers a great deal in the prevention of secondary ulcers.

In the operative treatment of ulcers of the stomach and duodenum it is of paramount importance to maintain a breadth of view, according to Ward (*Lancet,* August 20, 1921, 382) and to consider each ulcer on its merits. The surgeon who at once associates every ulcer with gastroenterostomy or with excision, as the case may be, will be disappointed in his results. Granting that the ulcer requires direct surgical treatment, it is our duty to explore the whole of the abdominal cavity before embarking on any surgical procedure.

Although gastroenterostomy is the most satisfactory operation for duodenal ulcer, it is occasionally followed by disappointment, which disappointment Foss (*Penn. Med. Jour.,* 1921, xxiv, 309) finds is often the direct result of faulty technic or of mechanical defect in the operation. Among the more common untoward results are vicious circle, gastrojejunal ulcer, reactivation of the original ulcer, the production of new ulcer and malignant degeneration in a gastric ulcer already established.

Of the mechanical defects or technical errors the most common are to be found in the use of the Murphy button, bobbin or a similar device; the formation of a long jejunal loop; the employment of the Roux or Y technic; the employment of such unnecessarily complex procedures as that of Ehrlich or of Vulliet; the use of the anterior operation; the failure to properly locate the stoma; the failure to make an opening of sufficient size; the use of non-absorbable suture, especially if the suture material be continuous; failure to properly funnel the stomach through the transverse mesocolon; infection during the operation, with the production of dense adhesions resulting in angulation of the jejunal loop; the performance of a gastroilostomy; failure to combine careful post-operative medical treatment with the surgical treatment.

Many failures are due to the fact that gastroenterostomy has been performed in the absence of a definite lesion or to a lack of thorough-

ness at the time of the operation, such as the neglect to remove dental infections, a diseased gall-bladder or a diseased appendix.

In estimating the results in a series of cases of perforated gastric ulcer Strœuli (*Schweiz. Med. Wock.*, 1921, li, 443) found that 41.2 per cent. resulted fatally. There were no deaths in the cases operated on within the first six hours; the mortality was 22 per cent. in the cases operated upon in the next six hours; in those between nineteen and twenty-four hours, the death rate was 50 per cent., and no recoveries followed in operations done 24 hours after perforation.

HOUR-GLASS STOMACH

In studying the records on fifty consecutive cases of hour-glass stomach, Thomas (*Brit. Jour. Surg.*, 1921, ix, 37) notes that only four occurred in men. The most noticeable feature was the long duration before surgical aid had been resorted to; the majority complained of gastric trouble for periods varying from 5 to 30 years. In no single patient had malignant disease supervened. It appears that the acute hemorrhage variety of gastric ulcer rarely leads to this deformity, but rather the chronic ulcer on the lesser curve. Many ulcers had completely healed leaving a dense scar, many had unhealed ulcers, some with extensive adhesions to surrounding viscera, others had a fold of the great omentum attached to the lesser omentum, suggestive of partial perforation.

Surgical intervention is the only possible means of cure, and there is no condition in surgery that may call for so great a variety of procedure to deal with the degrees and complications met with. It is highly important in many of these semi-starved patients to use every known means to increase resistance and prevent shock.

The various methods used are described, and from the end results the author thinks that no particular type of operation had much to do with the final result, provided a free flow had been established from the stomach.

PYLORIC STENOSIS

In a report of 50 cases of pyloric stenosis, Deaver (*Penn. Med. Jour.*, 1921, xxiv, 632) performed 46 operations. A gastroenterostomy was performed on eight of the earlier cases, four of which

died, giving a mortality of 50 per cent. The Rammstedt operation has been the operation of choice, thirty-eight cases were treated with the gratifying result of only three deaths, or 7.9 per cent. mortality.

The series of fifty cases shows the marked disproportion of 90 per cent. males to 10 per cent. females. A preponderance of males is likewise noted by other authors, some of them also claiming that the disease is apt to be more severe in boys than in girls.

The ages of the patients ranged from eight days to eleven weeks. One case included in the series, apparently congenital in origin, was ten years old at operation. Excluding this patient, since true congenital stenosis is rare after the first year, the average age at which the patients came to operation was nine and one-half weeks.

All the cases gave the history of loss of weight and vomiting, and in all but two constipation was also noted. These two cases, however, required operation. The average weight on admission was seven pounds, six ounces, or approximately 2.5 pounds below the normal for an infant of ten weeks. The average age at which vomiting set in was three and five-tenths weeks. In 10 per cent. of the cases vomiting set in at birth, and in one instance this symptom did not develop until the fourth month.

At the physical examination before operation, exaggerated peristalsis was noted in 91 per cent. of the cases, a palpable tumor being present in 62.5 per cent. Both these signs were present in one-half the cases while six per cent. showed neither of them. On X-ray examination complete stenosis was reported in 20 per cent., a slightly patulous pylorus in 30 per cent. and partial stenosis in 50 per cent. of the cases.

The post-operative course usually presented a prompt febrile reaction, the temperature rising to about 102° F. and occasionally to 104° F., but in the series, 20 per cent. showed no rise at all in the temperature after operation. Vomiting is a more constant post-operative symptom. It was noted in 85 per cent. of the cases, the average duration being about thirty-six hours, but it was never protracted beyond the fifth day. The stools became normal in from one to four days. Convalescence averaged thirteen days, ranging from five to twenty-five days, the patients on discharge showing an average gain of six ounces over the weight on admission.

INTESTINAL OBSTRUCTION

The experimental aspect of this subject has been reviewed by Bacon, Anslow and Eppler (*Arch. of Surg.*, 1921, iii, 639), who conclude from their studies that (1) The rise in concentration of non-protein blood nitrogen observed in intestinal obstruction is due, not to that condition *per se*, but to the accompanying water loss.

2. An increase of blood nitrogen in intestinal obstruction may be prevented by the administration of sufficient water.

3. An increase of blood nitrogen may be experimentally produced in the absence of intestinal obstruction or of a preëxisting nephritis by the adoption of any measure calculated to produce severe thirst.

4. Death from intestinal obstruction is, in the absence of complications, due to toxæmia from the protein disintegration which occurs after severe water loss. It is the most common clinical example of death from thirst.

5. The toxic nitrogenous residue is excreted from the blood stream by the intestinal mucosa into the intestine where it may exist in higher concentration than in the blood. If not drained out, on relief of the obstruction, the material may be reabsorbed by the lower bowel and colon, causing an increase of the already existing toxæmia.

6. Fever in intestinal obstruction may be of aseptic origin and indicate nothing more than the protein disintegration occurring in severe dehydration.

7. An increase in the non-coagulable blood nitrogen of diverse conditions, as heat stroke, peritonitis, pneumonia and the atrophy of infancy, depends on low water reserve and in the absence of nephritis may be used as a reliable guide for the administration of water.

8. The two chief theories of fever, the protein theory of Vaughan and the dehydration theory of Balcar, Sansum and Woodyatt, may be unified by showing that the latter depends on the former.

Based upon a study of 245 consecutive cases of obstruction, Finney (*Surg., Gyn. and Obstet.*, 1921, xxxii, 402) believes that difficulty may be experienced in making a diagnosis, especially in post-operative cases.

Definite diagnosis is not necessary before operative measures are begun.

Early diagnosis is the most important factor in the whole category.

It is better that the operation should be done early than well. Better a poor operation done on a patient in good condition, than a good operation done on a patient in poor condition.

One is too highly influenced perhaps, in delaying operation in post-operative cases, by the fact (a) that the patient has just gone through a major surgical operation and both he and the surgeon dislike exceedingly to submit again to that trying ordeal; (b) that so many cases, comparatively, have symptoms strongly suggesting intestinal obstruction, especially after certain forms of abdominal operation, and recover completely after rest, gastric lavage, starvation, enemata, and medical treatment, that the temptation is strong to postpone the operation unduly in the hope that relief may be afforded through these means. Hence often valuable time is lost in this way, and when operation is finally decided upon, it is too late.

In the treatment of acute ileus and as a preventive of post-operative ileus, jejunostomy is advocated by McKinnon (*J. A. M. A.*, 1921, lxxvii, 274), who finds that there are other conditions besides acute obstruction in which jejunostomy has proved to be a life-saving operation; for instance, in perforated ulcer of the stomach, in general suppurative peritonitis, in perforations and resections of the bowel.

To a jejunostomy performed at the completion of the operation to forestall a possible ileus, the name complemental jejunostomy has been given.

It has been his observation in complemental jejunostomy that for the first twenty-four hours the drainage is slight, consisting of a few ounces of bile-stained mucus. After this period drainage is profuse. When normal peristalsis is restored tube drainage ceases. One of the most striking results is the absence of post-operative pain and discomfort, as repeatedly expressed by patients who have formerly undergone abdominal operations. Invariably they will tell you that during their convalescence from former operations they suffered from gas pains. The question has often been asked, does leakage of the bowel follow the removal of the tube? The answer is, that there is a cone of intestine projecting into its lumen. When the tube drops out, this acts on the principle of a safety ink bottle, thus preventing drainage.

In acute obstruction of the bowel, a high jejunostomy will drain the intestine immediately and continuously, as long as peristalsis is

active and reversed. The abdomen should be opened under local anæsthesia. Even in cases that are seemingly hopeless, and in which drainage is not free after jejunostomy, it is found that washing out the stomach and the introduction of coffee, whiskey, etc., through the tube sometimes stimulates peristalsis, and drainage soon becomes profuse and continuous.

A jejunostomy performed following a serious abdominal operation (complemental jejunostomy) practically does away with post-operative vomiting. It eliminates gas pains and it always prevents post-operative ileus. It is valuable in desperate cases.

Flint (*Brit. Med. Jour.,* 1921, i, 729) reports a mortality of 15.6 per cent. in 282 consecutive cases of acute intestinal obstruction.

This comparatively low mortality he attributes to early operation, preservation of warmth, gastric lavage, saline infusion and the administration of morphine until the respiratory rate falls to 12 per minute. Experience in determining the viability of the affected gut is important as the mortality was 9.3 per cent. in cases in which resection was not necessary and 47.8 per cent., when the latter operation was performed.

GALL-BLADDER

In considering the result of surgical interference in biliary lesions, Graham (*Arch. of Surg.,* 1921, iii, 154) states that it has been disappointing to a certain percentage of the profession. This conclusion to a large extent is due to the fact that biliary colic was the signal for operation in the past, and surgery could immediately relieve this. To-day we are attempting earlier treatment and at a time in the course of the disease when surgery can deal only with the exciting cause, having to depend on nature and the lapse of time to repair the damage done to the nervous mechanism and thus abolish the reflex disturbances. This improvement may in a fair percentage of cases be spectacular; but in the type of case in which there is a definite relationship between the attack and mental and nervous exhaustion, the improvement will be definite but gradual over a period of from ten to twelve months.

In his experience, the stone cases have a certain chance of complete cure from drainage, but in replies to his questionnaires he finds that

in the earlier acalculous cholecystitis cases in which drainage was used there is a persistance of a certain degree of gastric distress.

From his observations he concludes that the primary etiologic factor in gall-bladder disease is bacterial infection. If, however, the patient seeks relief at this time, it will be most often because of an acute inflammatory lesion of the gall-bladder.

The chronically diseased gall-bladders produce symptoms of a reflex nature as a result of tissue changes, resulting from the presence of an avirulent organism.

The vast majority of gall-bladders removed for reflex symptoms are sterile on culture.

The diagnosis of a diseased gall-bladder rests largely on a well-taken history, keeping in mind the innervation from an embryologic standpoint, and thus making possible a correct interpretation of clinical symptoms.

The increased efficiency of gall-bladder surgery lies in the avoidance of stereotyped operations, the recognition of the whole pathologic condition present, and then suitably dealing with it.

Many important facts are noted by Meyer (*Annals of Surgery,* 1921, lxxiv, 439) in his article on "Chronic Cholecystitis Without Stones." He has found that aspiration of bile from the living gall-bladder during operation having shown the same stigmata as that collected from the duodenum in the fasting condition, before operation, definite proof has been rendered that the examination of the duodenal contents, obtained by the duodenal tube, with the patient in the fasting condition, deserves confidence and is to be considered a reliable procedure.

A glistening, bluish, soft and non-adherent gall-bladder found during operation may be diseased and harbor pathologic organisms within its walls. These organisms leave their place of habitation at times and enter the gall-bladder contents, infecting the bile stored within, although this bile has left the liver and reached the gall-bladder in a sterile condition. Recurrent attacks of inflammation, varying in severity according to the degree of virulence of the bacteria, will be the immediate consequence.

The bile within the gall-bladder, though discolored and turbid, is often found sterile. This is explained by the bactericidal action of the bile as such, and the but occasional presence of active bacteria

within the bile. Aspiration of a certain quantity of bile at a given moment during the operation may just strike a sterile fluid, which, at other times, may contain bacteria.

In view of the fact that bacteria are frequently found in the centre of gall-stones, we can understand how it happens that cholecystitis without stones is the precursor of cholecystitis with stones.

Cholecystectomy in cases of cholecystitis without stones, therefore, clearly represents a prophylactic operation in many instances, and is of particular benefit to those who must get well in order to be able to earn their living.

It has been shown that the black fluid, furnished by the Meltzer-Lyon test, the so-called B bile, as collected from the duodenum by siphonage through the duodenal tube, after the instillation of a 25 per cent. solution of magnesium sulphate, is mostly a liver product, representing the immediate effect of absorption of the injected substance upon the liver cells. The bile contained in the gall-bladder seems to play no important diagnostic rôle in the cycle of secretions, though frequently some of it will be admixed to the so-called B bile.

Repeatedly direct visual inspection of the gall-bladder during operation, with the tube in place and the instillation of a 25 per cent. magnesium sulphate solution into the duodenum, has failed to show the slightest physical contraction of the viscus, the latter having been under closest observation of the author and his associates for more than twenty minutes.

The Meltzer-Lyon test has therefore little, if any, value in diagnostic respects, but it promises to be of great importance in the treatment of diseases of the biliary system.

Chronic cholecystitis without stones is a much more frequent disease than has been heretofore believed. Clinically, it seems to take the same place in the upper abdomen as chronic appendicitis does in the lower.

Chronic cholecystitis still belongs to the borderland. Though not as treacherous and deadly in its sudden attacks as inflammation of the appendix may be, it nevertheless often undermines the patient's health and should, therefore, as a rule require the removal of the gall-bladder.

If only drained temporarily, such a gall-bladder may become the seat of a recurrent inflammation at any time and without any known

provocation; it may also harbor stones at a later date. A patient thus afflicted who will not or cannot submit to cholecystectomy, may then pass into a state of chronic invalidism. His gall-bladder represents the same type of infected focus from which absorption takes place intermittently—autointoxication—as the tonsils, suppurating teeth and intestinal stasis do.

Cholecystectomy represents the radical cure, and should be advised after the laboratory analysis, outlined before, has established the refined diagnosis. It appears that cholecystectomy is as well borne by the human system as appendectomy. The mortality of the operation, done in the interval, is almost as neglible as that of appendectomy in the interval stage. Here, too, we may expect that 100 per cent. of the patients recover; some extraordinary and unforeseen something beyond the surgeon's control, would have to happen, if the patient did not recover.

Temporary drainage of the abdominal cavity after ectomy is considered an absolute necessity. Air-tight suture of the peritoneal sac means taking chances with the patient's life, as the ligature of the cystic duct may give way for unknown reasons a few days after operation, and the leakage of infected bile then cause peritonitis and death.

Inspection and palpation of the gall-bladder during operation must cease to render the only indication for cholecystectomy. The quality of the bile, determined systematically, with the help of the duodenal tube previous to operation and, if desired, the condition of the bile aspirated from the gall-bladder during the operation, must guide the surgeon in his decision of where to incise and what to excise.

Many important questions, naturally, still remain unsolved and require further study, for instance:

Is the color of the normal bile always golden-yellow; in other words, does green or brown bile in a gall-bladder or a mixed color always indicate pathology?

May the wall of a gall-bladder contain microöganisms, and the viscus still be considered non-pathologic? In other words, does the presence of bacteria in the wall of a macroscopically seemingly healthy gall-bladder always represent the first stage of the cycle of the pathological events up to the eventual formation of gall-stones?

Do the bacteria reach the viscus from the duodenum, or by way of the arterial blood stream, or the lymph current?

Rosenow's experiments (*Surg., Gyn. and Obstet.*, 1921, xxxiii, 19) on focal infection have a decided practical bearing in the treatment of gall-bladder disease.

The occurrence of lesions in the gall-bladder and in the pancreas of animals following injection of bacteria from the cases of suspected cholecystitis without stone and with pancreatitis, and the relatively high incidence (21 per cent.) of lesions in the gall-bladder following injection of the ulcer strains, and in the stomach and duodenum (29 per cent.) following injection of the gall-bladder strains, suggests that the common association of two or more of these conditions in man may also be due to embolic infection by bacteria having affinity for the structures involved.

The demonstration that the foci of infection in tonsils and teeth, so commonly noted in patients with ulcer of the stomach, cholecystitis, pancreatitis, or appendicitis, contain bacteria which reproduce these respective diseases in animals, suggests strongly that such foci must be important factors in the production of these conditions in man.

The careful elimination of foci of infection should become a routine procedure in both the medical and surgical management of these diseases. The focus should be removed before the mechanical factors, such as much scar tissue in chronic ulcer, gall-stones in cholecystitis, and fæcal concretions or kinks from adhesions in appendicitis, have come to play a dominant part. The benefits should be especially noticeable in preventing acute attacks, in diminishing the number and severity of exacerbations in the chronic condition.

There has been considerable discussion concerning the omission of drainage following cholecystectomy.

Buchbinder (*J. A. M. A.*, 1921, lxxvii, 257) directs attention to the harm done by unnecessary drainage. First of all, the post-operative convalescence of cases in which the abdomen has been closed is much easier, and more rapid. Post-operative pain, nausea, and other evidence of peritoneal reaction are reduced. There is no question but that the drain is responsible for most of this, and we are all familiar with the relief that comes with the removal of the drain. It occasionally happens that while the peritoneum may be closed, complete closure of the abdominal wall is not advisable because of the liklihood of an infected wound. In these cases drainage of

subcutaneous fat or fascia causes less discomfort than peritoneal drainage.

The incidence of post-operative hernia is, of course, reduced to a minimum by tight closure of the peritoneum, and hernia is by no means infrequent following drainage for operations on the gall tracts. The omission of drainage is by no means an absolute method of avoiding accidental wound infection, but such wound infection is no more frequent than in any other clean abdominal wound.

In advocating the advantage of cystico-choledochostomy Reid (*Annals of Surgery,* 1921, lxxiii, 458) observes that prolonged leakage of bile is distressing in its consequences to those who withstand it and has occasionally, both directly and indirectly, been responsible for the death of the patient.

The incision into the common duct should be closed and the tension on the suture line be relieved by a tube passed through the cystic duct.

This tube, if properly fitted, may function for weeks, conveying the bile, without peritubal leakage, to the surface.

On removal of the tube the discharge of bile through the fistula ceases either immediately or within a day or two, provided the common duct is not obstructed.

The patency of the duct may and should be tested by clamping the tube.

PANCREAS

This organ is so often involved in pathologic conditions of the viscera surrounding it and even in disease of more remote regions, and direct attack on the pancreas is as yet fraught with so much danger, that a proper consideration of prepancreatic and peripancreatic disease as forerunners of acute or of chronic pancreatitis becomes of vital importance, according to Deaver and Sweet (*J. A. M. A.,* 1921, lxxvii, 194). In these days, when preventive medicine occupies so conspicious a place in the medical forum, it behooves the surgeon also to concentrate attention on conditions which make for preventive surgery.

The most frequent forerunner of disease of the pancreas is some affection of the gall-bladder or the bile passages, which is frequently, but not always, associated with calculi. Extension of such an inflam-

mation mainly by way of the lymphatics gives rise to lymphadenitis along the course of the common duct and its lymphatics in the right free border of the gastrohepatic omentum, and to a peripancreatic lymphangitis and lymphadenitis with enlargement and hardening of the adjacent portion of the pancreas itself. Not alone from the gall-bladder and the bile passages, however, does the pancreas become involved; but very often such involvement forms part of the pathology of gastric and duodenal ulcer. Although the pancreas itself is resistant to the action of the gastric juice, it may form part of the base of a gastric ulcer, and its lobules can frequently be seen lying free in the base of the ulcer, although the inflammatory process is most liable to produce thickening of the interstitial tissues and hardening of the surface of the organ. The possibility of perforation of such an ulcer, with the danger of acute pancreatitis added to the already threatening condition, must be kept in mind. The serious effect on the pancreas of chromic ulcer of the duodenum is a familiar story to those who have occasion to treat a considerable number of these ulcers.

After discussing the route of infection in these cases, Deaver concludes that if the papillæ of Vater were always so arranged that infection could enter the pancreas from the bile passages, which they are not; if the ducts were always so arranged that infection could involve the pancreas through the duct of Wirsung, which they are not; if cases of chronic pancreatitis showed clinical symptoms which might be ascribed to transitory attacks of limited acute pancreatitis, with later transformation of the degenerated acini into sclerosed areas, which they do not; if cholecystostomy, with prolonged drainage, could always drain the pancreas, which it cannot; if cholecystostomy, with prolonged drainage, ever did more than might be ascribed to the drainage of the gall-bladder, which it does not; if cholecystectomy, which causes dilatation of the biliary passages, this dilatation showing increased pressure, aggravated the condition supposed to have been caused by increased pressure due to the spasm of the muscle of Oddi, which it does not; then we might be led to tinker with the papillæ of Vater. But, he proposes, in view of these facts, to continue to think of chronic pancreatitis as a lymphangitis, secondary to a focus of infection in the wall of the gall-bladder; and as surgeons have always done and always will do, he will continue to remove the focus of infection and cure the condition.

PELVIC ABSCESS

On the basis of a very thorough study of 462 cases of pelvic abscess that were treated by vaginal incision and drainage, Wharton (*Arch. of Surg.*, 1921, ii, 246) concludes that this procedure has two distinct functions: (1) As a method of pelvic diagnosis; (2) as a method of treatment. In the presence of pelvic tumors of uncertain origin, a vaginal incision will often establish the diagnosis and place the operative indications on a rational basis. As a therapeutic procedure in pelvic abscess, it has been most uniformly successful in giving drainage to pelvic collections, checking the spread of the infection and relieving the patient of her immediate symptoms and the danger of complications. This much can almost always be accomplished by this procedure. In 25 per cent. of all of the patients the relief has proved to be lasting, as in these instances they have been permanently relieved of all symptoms, have enjoyed perfect health, and in some instances have even given birth to normal children afterward. In 75 per cent. of the patients, however, this relief has been only temporary, and of these a large number have returned for operative treatment of a more radical nature which would offer greater assurances of permanent relief. In these cases, the previous drainage of the pelvic abscess has rendered it both safer and easier to perform operations of a conservative nature.

From this summary it is not difficult to determine the proper rôle of this operative procedure in the treatment of pelvic abscess and the purulent forms of pelvic inflammatory disease. As a measure of expediency, it undoubtedly saves life and makes it possible to avoid many a hazardous abdominal operation under extremely unfavorable circumstances. As a conservative surgical procedure in itself, its use has resulted in permanent relief in 25 per cent. of all cases, and for this reason, if for no other, should always be tried in every case of pelvic abscess that is amenable to this form of treatment. In the majority of instances, however, it has proved to be but the first step in the safest and most conservative method of obtaining permanently good results in the treatment of patients with pelvic abscess. In view of the findings in this series of observations, we are compelled to admit that as a curative procedure vaginal incision and drainage is in the majority of instances a failure, but when considered and used as a measure of expediency to be followed

when necessary by the employment of more radical procedures, it has a definitely indicated use and fulfills an important function in the conservative operative treatment of pelvic abscess and the purulent forms of chronic pelvic inflammatory disease.

APPENDICITIS

In reviewing the mortality and complications of 584 cases of acute appendicitis, Bancroft (*J. A. M. A.*, 1920, lxxv, 1635) emphasizes the importance of early operation in decreasing mortality, complications and unfavorable sequelæ. The number of late cases, 206 or 35 per cent. of the patients had either developed localized abscess or diffuse spreading peritonitis, justifies the plea for early operation. The study of the abscess cases shows that there is no decrease in mortality over acute appendicitis with free fluid, while the secondary complications and late sequelæ are greatly increased with abscess.

As a matter of economic efficiency, a patient spends much less time in the hospital and is returned to his normal occupation in a much shorter time if his acutely diseased appendix is removed at the earliest possible moment.

Regarding the omission of drainage in questionable cases, the fact that two of the patients who died (8 per cent. of the entire mortality in the series) might have been saved by drainage emphasized the old dictum, "When in doubt, drain."

Post-operative hernias occurred in 15 per cent. of drained cases as revealed by an efficient follow-up system. The recognition of this high rate of incidence will be an incentive to every surgeon to attempt to reduce these figures in the future.

Prolonged drainage seems the greatest factor toward the production of post-operative hernia. The average time that these patients were kept in the hospital, twenty-seven days, as compared with nineteen days, the average of all the drained cases, suggests that it is not a question of getting the patient out of bed too soon; and as the percentage is relatively low between the years from 11 to 30, muscular exercise and hard work following operation are smaller factors than we had assumed. Our endeavor therefore must be directed toward small incisions with adequate drainage, protection being given as far

as possible to the aponeurosis of the external oblique, which is susceptible to infection and is prone to slough when traumatized.

For some time the Carrel-Dakin technic has been used, beginning about the fourth day after operation, and a number of secondary closures with suture of the muscles have been performed.

SPLEEN

A large experience with splenectomy for injuries and acute diseases and the removal of the spleen for various pathologic conditions, sustains the view according to Mayo (*Arch. of Surg.*, 1921, ii, 185) that the spleen is only one of the hemolymph bodies and various other tissues which have the power to destroy the worn out red cells and to develop white cells; and that its changed function in disease does not so much concern the character of the red cells which occur in pernicious anæmia as their reduction in value. The spleen is concerned with excessive destruction of the red cells rather than with the disturbance of their creation, and the regulatory effect on the bone marrow, about which so much has been said, is probably indirect rather than due to the as yet undemonstrated hormone. The anatomic structures of the spleen are involved in certain diseases somewhat differently, sufficiently to give rise to microscopic and macroscopic pictures which have some value. Such morphology as is shown in generalized fibrosis and thrombophlebitis, for example, without regard to the cause, can be looked upon as the agent at least whereby the secondary anæmia and probably the portal cirrhosis are produced.

The effect on the liver is quite the same as those forms of portal cirrhosis which have their origin in the alimentary tract.

With our present knowledge, therefore, satisfactory classification of the diseases of the spleen which are concerned in the anæmias is not possible. One of the greatest difficulties in arriving at satisfactory data concerning the splenomegalias is that ordinarily we are unable to know that the spleen is enlarged until the enlargement is sufficient to be palpable beyond the free margin of the ribs, approximately twice the normal size. Percussion is an unreliable and overrated means of determining the size of the spleen. Röntgen-ray examination of the oxygen-distended abdomen, of course, has value, but we will not often apply this method to the ordinary anæmias. Early evidence, therefore, of the primary manifestations which take place in the spleens event-

ually developing splenomegalia of palpable size can seldom be obtained. Information has been fragmentary and inclusive, but the material observed by Mayo has led him to believe that generalized splenic fibrosis and thrombophlebitis are the result of many causes, and the pathologic changes in the spleen, the liver and the blood are regularly developed without regard to the primary etiologic factors.

The toxins which may enter or leave the spleen are grouped by Moynihan (*Lancet,* 1921, cc, 157), according to their supposed actions:

1. The most active poisons which cause anæmia ("anæmizing"); these prevent the formation of red blood cells.

2. The hæmolyzing poisons which play the chief part in hæmolytic splenomegaly.

3. Poisons which excite fibrosis; these are very common.

4. Poisons which excite cell proliferation; these may concern the cells of the malpighian bodies, as in lymphatic leukæmia and some kinds of Hodgkin's disease, or the cells of the spleen pulp.

Anæmia may be caused by many diseases. When hæmolysis is associated with anæmia, a disease of the spleen is to be suspected. Fragility of the red cells does not indicate, however, that the seat of the disease in which it occurs is in the spleen. Moreover, every anæmia associated with disorders of the spleen is not characterized by hæmolysis.

A second group of anæmias are those in which the initial disorder is either in the bone marrow or dependent on the same as that which affects the bone marrow. The clinical phenomena due to the hæmolysis are absent in diseases in which the liver cell is equal to its work and does not suffer impairment, that is, in Hodgkin's disease, myeloid and lymphatic leukæmia, sarcoma of the spleen, and lymphogranuloma.

When Jaundice arises as the result of a toxic process in the spleen-liver system, consideration must be given to (1) the site of action of the poison, and (2) the nature of the poison.

In portal cirrhosis Mayo (*J. A. M. A.,* 1921, lxxvii, 34) states the spleen may play a prominent part in the etiology, and splenectomy in properly selected cases may be of great benefit. By splenectomy not only the supply of toxic material, if there be such, is cut off from the general circulation but also the portal blood-stream is reduced by

subtraction of the amount of blood poured into the portal vein from the spleen, about 25 per cent. of the total under normal conditions. After the removal of some of these huge spleens an enormous reduction of the portal circulation takes place, so that the hepatic cells may be relieved of a sufficient overload to enable them to function normally, and moreover the liver under favorable circumstances has the power of regeneration. In all, eleven patients with portal cirrhosis were subjected to splenectomy with four deaths in the hospital. All of these patients were in the last stages, with ascites, hemorrhage from the stomach, and so forth. After the removal of the spleen the omentum was spread in the denuded splenic area and fastened to the abdominal wound in order to give the additional benefits of the omentopexy. Four of these patients were markedly benefited. One patient is now alive after five years. In early operations the operative mortality would be small and the end-results much better.

Splenectomy was performed in six cases of primary biliary cirrhosis with greatly enlarged spleens. In these cases the cause of the biliary infection, so far as could be learned, had been removed previously, such as gall-stones, and focal infections, without marked relief. All of the five patients who recovered were greatly benefited; three are alive two years; two, three years, and one, five years after splenectomy.

Splenic Anæmia.—Of the 429 splenectomies, seventy-one were for splenic anæmia of unknown origin, with nine deaths. In addition splenectomy was performed in thirty-eight cases for splenic anæmias of known origin.

Chronic Sepsis.—Eleven spleens were removed which had become greatly enlarged in the course of chronic general sepsis following septic arthritis, tonsillitis, phlebitis and osteomyelitis, with three deaths in the hospital. The other patients were cured or greatly benefited.

Syphilis.—Splenomegalia is often found with chronic syphilis, especially in the cases in which thorough treatment fails to maintain a negative Wassermann reaction. Some observers who have had wide experience with syphilis have believed that the large majority of cases of so-called splenic anæmia are syphilitic in origin. In the syphilitic spleen generalized fibrosis and thrombophlebitis are found as well as specific changes, especially modified forms of gumma; frequently

spirochæta pallida can be demonstrated. The spleen was removed in six cases of this kind, with one death in the hospital. Patients who had resisted thorough syphilitic treatment, and in whom chronic anæmia was a manifest sign, were at once made amenable to treatment and quickly recovered.

Characteristic portal cirrhosis of the liver may be an end-result of syphilis, and finally death results from circulatory obstruction, ascites, hemorrhage from the stomach, and so forth, quite like the other cases of splenic anæmia.

Splenic Anæmia in Children and von Jaksch's Disease.—Von Jaksch has described an enlargement of the spleen in infants due to malnutrition which usually disappears on proper feeding, but some of these patients do not get well and the enlarged spleen and chronic anæmia are carried into early childhood. Eight spleens in such children were removed without an operative death, and when the condition has not been too advanced cure has followed. The spleens removed have shown the characteristic generalized fibrosis and thrombophlebitis.

Malarial Spleen.—Chronic malaria results in a splenomegalia with generalized fibrosis and thrombophlebitis that is recognized as a form of splenic anæmia; ultimately some of the patients develop cirrhosis of the liver, ascites, hemorrhage from the stomach, and the characteristics described by Banti. The removal of the greatly enlarged spleen of this type relieves the anæmia.

Chronic Splenomegalia.—Finally, there is a type of chronic splenomegalia more common in women than in men, which exists for years without great detriment to the patient beyond the weight of the enlarged spleen. The confused state of our knowledge at least brings one thought to mind, that the patient with an enlarged spleen should be looked on as potentially ill, and unless the cause can be shown and relieved, splenectomy may be considered. There is no sharp dividing line between these cases and certain varieties of benign tumors, splenic apoplexy, and cystic disease without traumatism in which a definite pathologic condition exists in the blood-vessels and may give rise to acute conditions such as intraperitoneal rupture of the spleen.

The mortality and end-results are satisfactory, considering the nature and condition of the patients subjected to operation. All

the patients operated on were otherwise incurable and progressing to a fatal issue. The death rate from splenectomy in such cases will be high, and not all patients who recover will be greatly benefited.

From his study of spontaneous subcutaneous rupture of the spleen, Connors (*Annals of Surgery,* 1921, lxxiii, 1) thinks it appears that the loss of the spleen has made no difference in the physical welfare of the patient. The blood picture in these cases at the last blood examination revealed but a slight deviation from the normal. The presence of accessory spleens must be considered an important factor. Direct blood transfusion is a great help in the successful outcome of these operations.

PERNICIOUS ANÆMIA

The relation of the spleen to pernicious anæmia is discussed by Mayo (*Annals of Surgery,* 1921, lxxiv, 355) who has reviewed the effects of splenectomy upon the condition. Previous to November 1, 1917, fifty splenectomies had been performed for definitely established pernicious anæmia. The operation was then discontinued almost entirely for three and one-half years. Since there was not sufficient evidence that splenectomy would cure these patients, and since at that time the procedure was not known to give a degree of palliation sufficiently greater than that following blood transfusion, it seemed wise to await the verdict of time. Giffin and Szlapka have recently investigated the condition of these fifty splenectomized patients, and the pessimism which existed has been partly dispelled, at least. It was found that 21.3 per cent. of the patients with pernicious anæmia survived the operation three years or more, living two and one-half times as long as the average in a similar group of non-splenectomized patients at the same stage of the disease, and that 10.6 per cent. are alive after more than five years. This clearly indicates in at least one-third of the cases that the average life of patients with pernicious anæmia is greatly prolonged, and in about ten per cent. the prolongation is sufficient to lead to the hope that cures may result in some cases. We must take into consideration too the fact that no allowance was made for the normal mortality for the age period; all the patients who died were considered to have died from pernicious anæmia. The results in these fifty patients have been much better than we expected they would be when we

abandoned the operation; they suggest that in certain early cases, of a type as yet not fully recognized, splenectomy offers a possibility of cure. Not only is this true, but also in the average cases the palliation following splenectomy is much greater than we have been able to obtain by blood transfusion. Transfusion gives temporary benefit. It seems to furnish red cells which may live and function for one or two months or more, but there is not as yet evidence that the actual prolongation of life by that means is considerable. The blood picture improves after splenectomy, but the achlorhydria continues, and careful examination of the nervous system does not show changes for the better in the physical condition of the nerve structure, although the patients are much better in this respect clinically.

The course of pernicious anæmia following splenectomy, generally speaking, is ameliorated, the relapses are less severe and the cord changes less rapid than after transfusion or any other form of treatment with which we are acquainted. One of the functions of the spleen is to destroy deteriorated red cells. Apparently in pernicious anæmia the red cells are born feeble and the spleen sacrifices red cells which, although imperfect, are the best the patient can produce and are capable of function. Removal of the spleen stops this destruction, but does not greatly affect the disease otherwise. The cases which seem to be most favorable are those in which hæmolysis is most active, and those least characteristic of the disease. It also seems certain that early cases give a better prospect of benefit than late cases. When the disease has advanced to the point at which the bone marrow has been injured beyond the power of recuperation, the most to be expected is a temporary abatement of the symptoms.

There is little evidence to show that the etiologic agents of pernicious anæmia arise in the large intestines. Pernicious anæmia annually destroys more than 6000 lives in the United States. Even though the disease is common, we have learned comparatively little concerning it during the past generation. It behooves us to keep an open mind, to study carefully the blood conditions of all patients who have diseases of the large intestine, to try to ascertain whether anæmia, achlorhydria, glossitis, or some other abnormal condition exists, and especially to study carefully all cases in relation to cause and effect in which the large intestine is removed or in which splenectomy is performed.

Bernheim (*J. A. M. A.*, 1921, lxxvii, 275) has drawn a comparison between the methods of transfusion, and states it will not do to pass this matter over lightly, we are entrusted with human lives, and it is little enough to ask that we assume the burden with serious thought. We may expect that in from 20 to 40 per cent. of all citrate transfusions, a reaction of greater or less severity will occur. In this state of uncertainty, let us attempt to sift those cases which would seem to run a fatal risk if a reaction occurred and give them the benefit of the more refined whole blood transfusion in which the percentage of reactions is hardly so much as 5 per cent. There are two great groups of cases in which citrated blood is unsuited, but as time goes on and more attention is paid to this matter, still further differentiation will probably be made. This is not an attempt to belittle the value of the citrate transfusion, as Bernheim realizes how much it has meant to the medical profession and to humanity at large. But it is necessary to recognize the fact that there are definite limitations to this method of giving blood and that failure to observe these limitations has caused unnecessary loss of life.

It is most unfortunate that the giving of whole blood necessitates a far higher degree of skill than does the giving of citrated blood. It requires great and constant practice, a real knowledge of surgical technic. Therefore, it seems that this method of transfusion must always remain in the hands of surgeons. There should be in every community, at least one man who is competent to carry out the whole blood method, and physicians should learn to differentiate their cases so that they may take advantage of this man's skill, and give to their charges that chance for life for which they come to him.

Unger (*J. A. M. A.*, 1921, lxxvi, 9) emphasizes certain precautions necessary in the selection of a donor for blood transfusion.

1. All individuals may be grouped broadly into four main groups. These groups are established by the presence of two "chief" agglutins in the cells. Besides "chief" agglutins, "minor" agglutins have been demonstrated.

2. Ninety-seven per cent. of adults have agglutins in their serums. They are, however, present in 13 per cent. of new-born infants. Only 25 per cent. of new-born infants have cells that can be agglutinated, as compared to 50 per cent. among adults. The full quota of agglutins and receptors is acquired between the third and fourth years of life.

3. Incompatibility between the blood of a mother and her newborn infant occasionally occurs. It is unsafe, therefore, to omit testing the blood preliminary to transfusion, even though the mother should act as donor.

4. It is not advisable indiscriminately to use the so-called "universal donor," as severe reactions have been observed following the use of donors of Group IV for patients of other groups.

5. The rouleaux-formation substance, even though acting on the donor's cells, is apparently harmless, and no untoward results have been seen following such transfusions.

6. It is unsafe to perform a transfusion, relying simply on the fact that donor and patient are of the same group. Preliminary to transfusion, the blood of every patient should be grouped and then tested directly against that of the prospective donor.

SODIUM CITRATE TREATMENT OF THROMBO-ANGITIS OBLITERANS

The general plan of treatment as used by Steel (*J. A. M. A.*, 1921, lxxvi, 429, has been to increase the capillary hyperemia and encourage the formation of a collateral circulation, namely: (1) Elevation of the leg and exposure to dry heat; (2) Bier suction cylinders; (3) administration of vasodilator drugs—potassium iodide and nitroglycerin; (4) intravenous and subcutaneous injection of drugs to lessen blood viscosity—Ringer's solution and sodium citrate; (5) femoral vein ligation and arteriovenous anastomosis. Operative measures have proved failures. The other plans of treatment have all given some measure of success.

The sodium citrate method is employed as follows: During the first month the patient is kept in bed with the legs constantly under a hot air electric light bath at 110° F.; 250 c. c. of 2 per cent. sodium citrate solution is given intravenously every second day. The second month the interval of injection is lengthened to every third or fourth day; daily leg massage is given and the patient is put in a wheel chair with the feet hanging down a short time each day; or, if the case is not advanced, some walking is allowed. The intervals of injection are now gradually lengthened until at the end of a year the patient gets one every two weeks. Increased walking is permitted as the symptoms subside and evidence of a functional collateral circulation appear. Potassium iodide, 10 drops three times daily, is given during the whole

course of treatment. The iodide is always well borne. The length of treatment is regulated by the results obtained in establishing a functional collateral circulation.

The effects of this plan of treatment have been: (1) Relief of pain after the second injection; (2) the checking of the gangrene and spontaneous amputation of the dead tissue; (3) healing of indolent painful ulcers, and (4) a slow but sure establishment of a collateral circulation, as shown by improved color, warmth of the foot, the swelling of the subcutaneous veins, and strengthening of any existing pulse.

BREAST

From a consideration of his and other cases, and from the published statistics of other writers, Winslow (*Annals of Surgery*, 1921, lxxiv, 341) maintains that carcinoma is the predominent neoplasm of the mammary gland and that it occurs in from 60 to 65 per cent. of all mammary tumors.

While it is probable that breast tumors are coming under observation earlier than was formerly the case, nevertheless, in the hospital with which the author is connected there has been no marked difference between the time at which this series of cases came under surgical care and that of the series collected in 1911.

Sarcoma occurs in about 3 per cent. of tumors of the breast. This condition is malignant and should be treated in as radical a manner as a carcinoma.

Non-malignant neoplasms occur in about 35 per cent. of all cases. No woman should be allowed to harbor a neoplasm in her breast, whether it be benign or malignant, or whether she be young or old. Sooner or later benign tumors tend to become malignant; and the time to remove them is while they are still benign. One woman in this series had a tumor in her breast forty-nine years.

It is unsafe to trust to the macroscopic diagnosis of tumors, however skilled one may be; and a microscopic examination of frozen sections should be made, at the time of operation, of all neoplasms of the breast in which there is any doubt as to their nature.

The question of the proper treatment of primary or secondary tumors of the sternum is open to debate. Should extirpation be undertaken or should they be treated with radium or X-rays?

Equally as serious, and even more frequent, is the extension of

cancer from the breast to the ribs. What should be done in such cases? A. P. C. Ashhurst says: "Even fixation to the chest wall does not necessarily contraindicate excision; the portion of ribs invaded may be removed." The only case in which ribs were removed in the series for recurrent carcinoma terminated disastrously, but a number of operations have been reported that have been at least measurably successful. Winslow thinks, therefore, that, while in most cases of direct or secondary involvement of the ribs no operation should be undertaken, in some cases it is justifiable and proper to resect the ribs and underlying pleura.

In clinically doubtful cases, Bartlett (*Annals of Surgery,* 1921, lxxiii, 740) states that laying aside all other considerations and confining one's self solely to the problem of giving the patient the greatest number of chances of cure in malignant conditions, one must take into consideration not necessarily all but rather a certain few clinical signs and symptoms, and one must do the complete operation or explore in every doubtful case.

The exploration should be done without delay. The breast should not be removed and an interval allowed to elapse between the time of removal and the pathologist's report. One should not remove the breast or the tumor for the purpose of immediate or subsequent pathological study.

One should cut down upon the tumor and should be sufficiently schooled in gross pathology to be able to make the diagnosis at a glance. Thorough coagulation with pure carbolic should be done immediately after the incision of a malignant tumor and then the complete dissection should proceed without delay.

No incomplete operation for tumor of the breast should be attempted in the absence of facilities for immediate diagnosis and the diagnosis must be confirmed in every case before the patient leaves the operating table.

Percy (*Surg., Gyn. and Obstet.,* 1921, xxxiii, 417), in describing a new and advanced surgical treatment for breast cancer, advances six new and additional factors in the technic that will, he is convinced, improve materially the present day statistics of the operation.

First, that only the hot knife be used in the removal of breast carcinoma, including a complete dissection of the axilla.

Second, that in the advanced type of case no attempt be made to preserve or secure skin flaps.

Third, that the skin around the denuded area (left without flaps when the breast and axillary glands are removed) be undermined from 2 to 4 inches with the hot knife.

Fourth, that in the after-treatment, besides the use of Dakin's solution, the arm on the operated side be maintained in an elevated position with the forearm resting on the top of the head, until practically the surface denuded by the hot knife is entirely covered with new skin.

Fifth, that vigorous, daily massage and forcible movement of the skin and arm adjacent to the denuded area be instituted as soon as granulations have commenced to appear.

Sixth, that the only carcinoma of the breast considered inoperable by the heat technic is the one where inaccessible metastasis has developed.

Percy finds in the post-operative care of the patient that the position of the arm has many things to recommend it. It is more comfortable than when the forearm is placed upon the chest, and the arm rigidly bound to the side of the thorax.

Most important, it requires the natural reparative powers of the body to supply a sufficient amount of new skin to permit of the final maximum normal movements of the arm. It is comparatively easy to get the arm down after being in this position, if necessary for weeks or months but it is almost impossible, as we all know, to get it up if the healing process has occurred while the arm is down.

The chances for the development of a lymphangitis and œdema from cicatricial occulsion of the axillary vessels are greatly lessened. In fact he has had no presentment of this condition in any case where this position has been strictly maintained until the wound has been completely covered with new skin.

The fourth requirement in the after-treatment, following the extensive removal of supposedly infected cancer-involved tissues, concerns the employment of active and vigorous movement of the edges of the wound circumference. This, however, will accomplish nothing until the bare space has begun to fill in with the resulting hyperplastic granular mass which nature finally puts in the place of the removed structures. When this is properly manipulated, *i. e.*, massaged, a new

skin, which is a remarkably good substitute for the original, develops. This usually requires 10 days to 2 weeks before a good start is made. In the meantime the wound is kept sweet with the Carrel-Dakin or Eusol solution. When the new tissue begins to appear the adjacent skin should be pushed toward the operated space, firmly and persistently, at least once each day. Failure to do this permits of the development of pale, grayish looking, easily bleeding, unhealthy granulations that will not cover with epithelium; but active, progressive, even forcible movement of the skin, as soon as the granulations are in evidence, encourages the development of a blood supply that initiates the development of a new epithelial covering in a most remarkable way. Epithelization never develops while the unhealthy bleeding, secreting granulations still persist. These are always an unfailing evidence that the massage and movement of the normal skin surrounding the operated field has been insufficient to make the necessary healthy changes required for the development of the new skin.

The results obtained from X-ray and radium in breast cancers up to the present time warrant Quick (*Surg., Gyn. and Obstet.*, 1921, xxxii, 156) in drawing the following conclusions:

1. The X-ray occupies a place in the treatment of every case of carcinoma of the breast.

2. In certain cases radium may be used to considerable advantage in combination with the X-ray.

3. The cases in which radium proves valuable in this combination are mainly:

a. Localized flat recurrences where surface applications of radium can be made directly over the lesion.

b. Bulky recurrences where radium emanation can be embedded directly into the tumor.

c. Axillary involvement which is always difficult to influence favorably with X-ray alone, where radium emanation can be embedded in the neoplasm or in the axillary fat tissue so as to give a diffuse radiation of the axillary space from within.

d. Inoperable primary cases where embedded emanation can be utilized to radiate the tumor from within, as well as the axilla, and even supraclavicular space in the same way, if necessary.

e. Primary cases refusing operation where treatment may be carried out much in the same way as in the inoperable primary cases.

4. The combination of radium and X-ray may, in some instances, change an inoperable into an operable case.

THYROID DISEASES

The results obtained by Marine and Kimball (*J. A. M. A.*, 1921, lxxvii, 1068) in the prevention of goitre are of such importance that a summary of their observations is of the utmost value in a review of thyroid disease.

Simple and endemic goitre in man may be prevented as cheaply and as simply as in the lower animals, by the administration of 3 to 5 mg. of iodine twice weekly, over a period of a month, and repeated twice yearly. In young individuals, with goitre of recent development, the curative effects of exceedingly small amounts of iodine are as marked as in the goitre of animals.

There are no dangers worthy of consideration associated with the administration of the quantities of iodine. Simple or endemic goitre most commonly develops during (1) fœtal life, (2) around the age of puberty, and (3) during pregnancy, and we believe that any plan that provides for its control during these three periods of life will practically eliminate endemic goitre. Goitre in the mother and fœtus can be prevented as simply as that of adolescence, but, practically, it would seem that it is a responsibility of individual physicians, supplemented by public education. The prevention of goitre of childhood and adolescence should be a public health measure, best administered through the schools in order to combine the important additional factor of education. Beginning with the period of puberty, goitre occurs approximately six times as frequently in females as in males. The question, therefore, whether general prophylaxis should include both males and females would depend to some extent on race and climate. In the United States, probably the maximum of prevention coupled with the minimum of effort would be obtained by giving iodine between the ages of 11 and 17 years.

The prevention of goitre means vastly more than eliminating cervical deformities. It means, in addition, the prevention of those forms of physical and mental degeneration, such as cretinism, mutism and idiocy, which are dependent on thyroid insufficiency. Further,

it would prevent the development of thyroid adenomas, which are an integral and essential part of endemic goitre in man, and due to the same stimulus. These multiple, circumscribed benign growths have many of the attributes of tumor, one of which is that their growth once initiated is frequently not controlled by iodine, as are all simple hyperplasias. The terminal metamorphoses are far more serious than those of simple hyperplasia, since in addition to hemorrhage, necroses, cyst formation, etc., probably 90 per cent. of the malignant tumors of the thyroid arise from these adenomas.

If the prevention of goitre is good preventive medicine, it is better preventive surgery. With so simple, so rational and so cheap a means of prevention at our command, this human scourge, which has taken its toll in misery, suffering and death throughout all ages, can and should be controlled, if not eliminated.

The indications for surgical treatment in the different types of goitre are considered by Sistrunk (*Surg., Gyn. and Obstet.*, 1921, xxxiii, 348). All goitres are divided into three classes: Colloid, adenomatous, and exophthalmic.

Colloid goitres occur in young persons, are not surgical and respond to treatment with iodine and thyroxin.

Adenomatous goitres usually appear in young persons. Twenty-three per cent. of the patients with adenomatous goitres seen in the Mayo Clinic show symptoms of hyperthyroidism, but these symptoms do not develop until the goitre has been present for an average of about 16 years. In young persons, unless the goitres attain considerable size or produce symptoms of pressure, they are not considered surgical. In the majority of instances after patients with adenomatous goitres have attained the age of 25 or 30, surgery is advocated. All adenomatous goitres associated with hyperthyroidism are considered surgical if the condition of the patient will permit an operation.

Exophthalmic goitres occur at any age, but most often between the ages of 20 and 40. The condition is best treated surgically and the best results are obtained in patients operated on early in the course of the disease before marked damage has been done to the vital organs. Many patients require one or two ligations of the superior thyroid vessels preliminary to thyroidectomy in order to make thyroidectomy a safer procedure. If care is exercised in selecting the type of operation which should be performed in a given case, the mortality following operation is low.

In order to determine the ability of the patient to withstand the strain of operative therapeusis in exophthalmic goitre, Cheever (*Arch. of Surg.*, 1921, ii, 21) offers these suggestions:

During an acute exacerbation of the disease, or in periods of great mental depression, operation is contraindicated.

Muscular weakness so great that the patient cannot walk and marked loss of weight with continued loss under absolute rest are serious contraindications.

Organic visceral disease so serious as to jeopardize patients' having any operation of similar technical type is a contraindication.

Operation should not be undertaken in the presence of an enlarged thymus, until its probable activity has been reduced by irradiation.

The Jewish race offers a distinctly higher operative mortality.

A metabolism of +30 introduces a serious risk, which undoubtedly increases with high rates, but not necessarily in proportion, and there is no rate of metabolism which alone contraindicates at least minor surgical procedure.

The "vagotonic" type is possibly more vulnerable to the operative ordeal than is the "sympathetico-tonic," but evidence on this point is as yet inclusive.

The minor procedures, whether consisting of injections into the gland, cauterizing or ligating operations, are often most valuable indexes of a patient's resistance to trauma.

In hyperthyroidism, operations will always be attended by a peculiar factor of danger, not present in other operations which are technically similar.

Crile (*Surg., Gyn. and Obstet.*, 1921, xxxii, 209) protects the "bad risk" patient—

Against suboxidation,
Against inhalation anæsthesia,
Against want of water,
Against pain,
Against absorption of wound secretions,
Against infection,
Against fear and worry,
Against post-operative hyperthyroidism,
Against hypothyroidism.

When protection against these is assured the operability of the

"bad risk" goitre patient becomes 100 per cent.; and the mortality is reduced to that attending the removal of benign pelvic tumors.

The formulation of this plan of treatment has been based upon experimental researches and upon the clinical study of a personal series of 821 ligations and of 2771 thyroidectomies. Of the latter, 1315 have been for exophthalmic goitre.

By the application of these measures, the mortality rate of all thyroidectomies has been reduced to 1.3 per cent.; of thyroidectomies for exophthalmic goitre, to 1.8 per cent.; of ligations, to 0.6 per cent.

The final series, still unbroken, includes 322 thyroidectomies and 139 ligations without a death.

The results of operation for the removal of substernal and intrathoracic goitres are very satisfactory according to Pemberton (*Arch. of Surg.*, 1921, ii, 1). The patients are almost immediately relieved of most distressing symptoms, and they are most grateful. The mortality is low. There were sixteen deaths in this series of 542 operations (2.9 per cent.). Two may be classified as due to faulty technic, one of these to the loss of blood after a thoracotomy for the exploration of a huge intrathoracic cancer, and the other to septicæmia, probably originating from the wound. Three patients died from pneumonia. Eleven died from acute hyperthyroidism seventy-two hours following operation. The average pre-operative basal metabolic rate was 43. These patients were recognized as bad surgical risks; most of them had been treated medically before the operation.

After studying 290 instances of malignant tumors of the thyroid and making an analysis of the literature, Wilson (*Annals of Surgery*, 1921, lxxiv, 129) has drawn the following conclusions:

Malignant tumors of the thyroid are much more frequent than is generally believed. Their correct clinical diagnosis is frequently missed (a) because they may have periods of development of from five to fifteen years and patients are not followed up long enough after operation, and (b) because not infrequently the tumor in the thyroid itself is relatively small and the character of metastasis is not determined, owing to the rarity of necropsies.

Pathologic diagnosis is difficult owing to the great variation in the histology of the tumor tissue and its resemblance to that of non-malignant processes.

There has been a marked failure of American surgeons to report

in the literature their cases of malignant tumors of the thyroid; this should be corrected.

Insufficient observations are at hand for determining the geographic incidences.

The age incidence at the date of diagnosis is greatest in the fifth decade.

The distribution by sex is about one man to two women.

Patients usually seek medical advice on the occasion of recent rapid growth in a long-standing nodular tumor of the thyroid. Some give histories of slow continuous growth.

Early thorough operations give a fair percentage of cures. Palliative operations in late cases with extensive local involvement are warranted.

Pathologic diagnosis must take into account the usual development of malignant tumors of the thyroid from proliferating embryonic adenomas.

The pathologist must be thoroughly familiar with the characteristics of proliferating adenomas, as first described by Langhans, in all their stages.

The pathologist must be on the lookout for the possible relationship of bizarre metastatic growths of tumors of the thyroid.

The pathologist, in his diagnosis for the guidance of the surgeon must consider the relative preponderance of proliferative and degenerative processes in the tumor, but a proliferating adenoma in a patient of cancer age should not be considered benign unless the process of degeneration is very extensive and thoroughly overbalances that of proliferation.

SUPPURATIVE PERICARDITIS

In the treatment of this condition the method described by Pool (*Annals of Surgery,* 1921, lxxiii, 393), resection of portions of the seventh, sixth and fifth cartilages meets the most important indications, namely, it opens the pericardium at its lowest part; involves little risk of injury to the pleura; provides ample drainage and allows such exploration as is necessary both at the time of operation and during the post-operative course. If the condition of the patient warrants it, this method is advisable, especially if a brief general anæsthetic can be tolerated. In some cases, a less extensive exposure

may seem imperative. Under these conditions resection of the sixth and seventh cartilages seems best. The procedure was employed in the case reported and gave quite satisfactory exposure and provided efficient drainage. In conjunction with the Carrel-Dakin method it probably would prove adequate for many cases. Resection of the sixth cartilage alone may be done readily under local anæsthesia and is tempting by reason of its simplicity, but the drainage is not satisfactory.

The Carrel-Dakin method appears well adapted to the post-operative treatment of suppurative pericarditis.

Believing that the posterior sulcus of the pericardium must be drained, Whittemore (*Surg., Gyn. and Obstet.*, 1921, xxxii, 371) devised an operation, suggested by the closed suction method used in early cases of empyema. By this technic the posterior sulcus can be drained, the fluid can be emptied from the pericardial cavity slowly, which is probably important, if there is a large amount, and furthermore no air is allowed to enter the pericardial cavity, which seems wise as we do not know just how much harm is caused by the entrance of air.

TETANUS

There are three factors to be considered in connection with the prophylactic use of the antitoxin, according to Ashhurst (*Arch. of Surg.*, 1920, i, 407): (1) The quantity to be administered; (2) the site of injection, and (3) the frequency with which it should be administered.

1. *The Quantity of the Injection.*—The usual prophylactic dose is 1500 units, U. S. A.

2. *The Site of the Injection.*—Usually it is administered subcutaneously. It is better, however, to administer it intramuscularly, in the immediate vicinity of the wound, in order to flood these tissues with antitoxin even before the absorption of toxin has begun. The antitoxin so injected finds readier access, it is believed, to the nerves of the wounded part, and is admitted to the circulation no less rapidly than when administered by the subcutaneous route.

3. *The Frequency of the Injection.*—The first injection should be given as soon as possible after the receipt of the wound. In military surgery, the first injection almost always can be given some

hours before proper care of the wound can be instituted. This fact is fortunate for the wounded man because of the frequency with which operation must be delayed; but in neither military nor civil life does this in any way impair the doctrine that proper care of the wound is the more important of the two factors in the prevention of tetanus.

That tetanus may develop after the prophylactic use of antitoxin cannot be denied; but such cases rarely develop very soon after the injury, and when they do appear seem to be less severe than are most cases in which no serum has been administered.

In the treatment of tetanus the indications are: (1) To remove the source which supplies the toxin; (2) to neutralize the toxin already formed; (3) to depress the functions of the spinal cord, and to nurse the patient.

A. *Removal of the Source of Supply of the Toxin.*—If this source is known it should be attacked directly: The wound should be widely opened and mechanically cleansed of foreign bodies, sloughs, etc. Then it should be treated with antiseptics, and a 3 per cent. alcoholic solution of iodine is the best. The wound should then be filled loosely with gauze soaked in the iodine solution. The use of any caustic should be avoided, as it favors the growth of tetanus bacilli by the formation of sloughs. If the nature of the case demands it for other reasons, amputation should be performed; then the stump should be left open and treated as the original wound.

B. *Neutralization of the Toxin.*—To neutralize the toxin the best remedy is antitoxin.

But here, again, as in the question of its prophylactic use, we must inquire as to the quantity, the site and the frequency of the injection.

1. *Quantity of Antitoxin Injected.*—No matter what the method of injection, the most important thing is to get the maximum quantity of antitoxin indicated into the patient's body as soon as possible. Delay even of a few hours may determine a fatal result; 15,000 units given within the first three hours after symptoms develop are of more value than 50,000 units given after six hours, or given in divided doses. It should be made a rule to administer the total quantity indicated as nearly as may be, all at one time; and after this overwhelming dose of antitoxin has been given, to keep the patient's system supplied with antitoxin, though in moderate amount, until his recovery seems assured.

It is pointed out that if the antitoxin is administered subcutaneously, immense quantities are indicated. For an adult, with the usual type of case, at least 100,000 units are required in the first twenty-four hours; although a less amount may be sufficient for a child or for a comparatively mild case, one cannot be sure of the fact, and it is better to give too much than not enough. Administered intravenously, a less amount is sufficient; probably 15,000 to 25,000 units should be administered at first, and if no effect is apparent, or if the good effect wears off, a similar amount should be given after the lapse of from eighteen to twenty-four hours. If injected intraspinally, from 3000 to 10,000 units should be given, according to the weight of the patient; this injection need not, as a rule, be repeated in less than from eighteen to twenty-four hours. Even when administered intraspinally, a certain interval must elapse before the effect of the antitoxin can be apparent. Intraneural injection, rarely used at present, should be made in as great amounts as the nerves will absorb.

SYNERGISTIC ANALGESIA

Synergism is explained by Gwathmey (*J. A. M. A.*, 1921, lxxvi, 222), as a reciprocal augmentation of the action of one drug by that of another. This effect is not due to a simple summation of similar pharmacologic actions, for they are altogether too great.

It has been definitely determined that the addition of a small amount of magnesium sulphate to the usual hypodermic of morphine increases the value of the hypodermic from 50 to 100 per cent. It is proposed to take advantage of the knowledge thus gained and convert colonic anæsthesia into synergistic colonic analgesia. In other words to get a complete brain block by using much smaller amounts of ether than heretofore employed and adding to this effect of ether the synergistic effects of the combined morphine and magnesium sulphate. It will depend entirely on the operation and the patient's mental attitude as to whether or not unconsciousness also shall be induced.

Two definite facts are established:

1. When magnesium sulphate (from 1 to 2 c. c.) is used with morphine (1/12 to 3/8 grain) instead of plain water, and given by hypodermic injection, the value of the morphine is increased from 50 to 100 per cent. That is, one hypodermic injection will do the work of from two to four.

This knowledge is immediately available for physicians and sur-

geons who use morphine for any purpose. It will prove of inestimable value in the transportation of the sick from place to place, especially in the transportation of the wounded from the battle field. The possibility of morphinism should be materially reduced.

2. Magnesium sulphate (from 6 to 15 c. c.) given by hypodermic injection two hours before an operation, followed by morphine sulphate hypodermically (from 1/12 to 3/8 grain) one hour before operation, when supplemented by nitrous oxide and oxygen (the oxygen being employed in a much higher percentage than usual) gives a safer and better relaxation than when ether is used.

Furthermore, synergistic analgesia is the logical evolution of general anæsthesia. Analgesia with consciousness is present oftener with colonic anæsthesia than with other methods of administering any of the general anæsthetics. This fact has been noted and commented on by every surgeon and anæsthetist who has used the method sufficiently to be familiar with the technic. Obviously, colonic anæsthesia was the first to be improved; and now an attempt is being made to improve anæsthesia for general surgery by synergistic methods.

In a second article Gwathmey and Greenough (*Annals of Surgery*, 1921, lxxiv, 185) tabulate their clinical experience with this form of anæsthesia. They found the average time after an operation for the administration of a sedative to be 16¼ hours with the synergists and 4 hours and 6 minutes without this aid. The patient is comfortable four times as long with the synergists as without them, and receives less morphine.

With the synergists, the appetite is better on account of the absence of wound pain and absence of gas. The normal appetite and absence of gas pain means a marked shortening of the convalescence as well as a much more agreeable one.

Without the synergists, there were 10 cases requiring supplementary sedatives—not including the first sedative—one of the cases having three repetitions. With the synergists there were no repetitions within twenty-four hours after the administration of the first sedative.

It may be possible that with improved technic the total amount of morphine used in any given case may be still further reduced. The fact that post-operative nausea and vomiting, and wound and gas pain are practically eliminated, is most important. In the light of our

present experience, these dreaded sequelæ of the anæsthetic and the operation can be entirely averted.

While synergistic analgesia is still but slightly understood, yet the sum total of the results is so overwhelmingly in its favor, as compared with any method of inhalation anæsthesia, that the writers have no hesitation in submitting these data at the present time.

Curtis (*J. A. M. A.*, 1921, lxxvii, 1492), in reporting a fatal case of poisoning following the use of magnesium sulphate, states that a study of the case together with evidence from previous experimentation on animals, indicates that magnesium sulphate solution sometimes produces profound changes in the liver and cannot be considered a safe anæsthetic for general use.

RENAL CALCULI

While the indications for operation are clear in the case of a single calculus, great care and thought must be given in the event of multiple renal calculi, unilateral and bilateral. In deciding on operation in any given case, Geraghty, Short and Schanz (*J. A. M. A.*, 1921, lxxvii, 901) believe that the operator is influenced by factors of immediate or remote importance. The development of an acute pyonephrosis, a complete ureteral block or other conditions may require immediate interference. In the other cases the possibility of preventing the development of future complications which may lead to renal destruction may justify the removal of the calculi. In any case, one should carefully consider whether the removal of the calculi will cause greater renal destruction than will result from the presence of the stones. One should further consider whether the improvement in the kidney condition which will follow the removal of stones will justify the operative risk. And lastly, one should consider the feasibility of the complete removal of all the calculi. A conservative attitude in the handling of many of these cases will be found to lead to better results as far as concerns the comfort of the patient and his duration of life.

PROSTATE

The indications for the two-stage operation recognized by Deaver and Herman (*Arch. of Surg.*, 1921, ii, 231), are:

(a) In cases of acute retention due to prostatic hypertrophy, uncomplicated by stricture of the urethra, it is indicated. In a very few instances, the indwelling catheter may be used advantageously when the passage of the instrument is accomplished with ease and gives rise to no discomfort. But as a rule, these patients arrive at the hospital with badly traumatized urethras, as the result of long and futile attempts to pass instruments. With this class of patients, no time is lost in providing suprapubic drainage. A de Pezzer catheter may be introduced into the bladder at its summit, under local anæsthesia, if the surgeon prefers this to ether or nitrous oxide and oxygen. The catheter may be introduced through a small incision, so that but little urine is lost, and the bladder is subsequently emptied intermittently.

(b) In most cases in which there are great quantities of residual urine it is indicated. In many instances, the operation is preceded by a few days of intermittent catherization.

(c) All patients with badly infected bladders—this includes the majority of cases complicated by calculus—should be treated by the two-stage operation. In the two latter groups of cases, we prefer drainage tubes of large caliber rather than the de Pezzer catheter. Subsequent removal of the prostate is thus simplified.

(d) The two-stage operation is especially indicated in that small group of cases in which drainage is necessary, but in which bleeding from the prostate prevents the otherwise indicated indwelling catheter.

It is extremely difficult to state precisely what influence the two-stage operation has had on the general prognosis in prostatic surgery. The authors believe that it is not only a life-saving measure in that group of cases urgently in need of palliative treatment but in which the catheter is ill-borne, but also in many cases in which the catheter has been used with apparent success in the past. Preliminary cystostomy is, without doubt, the most efficient means of preventing kidney breakdown and the spread of septic infection. It minimizes hemorrhage following the enucleation of the prostate and thus promotes rapid convalescence. To practice preliminary drainage, however, when preliminary drainage is unnecessary, as is the routine practice of some surgeons, seems scarcely logical.

In cases regarded as bad surgical risks, Bugbee (*J. A. M. A.*,

1921, lxxvii, 905) states that the prime indication is to improve elimination. He regards old age, in itself, as not a contraindication to operation, and has probably been overestimated as a risk.

Even in the presence of advanced cardiac and renal complications, prostatectomy may be carried out with success by a step-by-step process, improving the local condition, of the urinary organs with each step, and giving much attention to the patient's general condition as one progresses. Hemorrhage should be avoided at the enucleation of the prostate, much of the shock and renal insufficiency being thus prevented.

The mortality resulting from such a procedure will be slight. Pulmonary embolus is always a possibility, and probably a more frequent occurrence than after most other types of operation.

A clinical study of prostatic carcinoma is presented by Bumpus (*Surg., Gyn. and Obstet.,* 1921, xxxii, 31) who has drawn the following conclusions:

1. Metastasis to the glands probably occurs more frequently in cases of carcinoma of the prostate than is demonstrable clinically because of the inaccessibility of the glands first involved.

2. Two distinct types of carcinoma of the prostate are distinguishable clinically and microscopically.

3. The smaller type of carcinoma of the prostate gives clinical and microscopic evidence of greater malignancy.

4. The larger type of carcinoma of the prostate tends to remain localized, resulting in more urinary symptoms and producing metastasis later in the disease than the smaller clinical type.

5. The larger clinical type of carcinoma of the prostate is more amenable to radium therapy because of its lesser potentiality of malignancy.

6. One-third of the patients with carcinoma of the prostate have osseous metastasis demonstrable by the röntgen-ray.

7. The pelvis and spine are the most frequent sites of osseous metastasis.

8. Metastasis occurs rarely in the lungs, probably never without involvement elsewhere.

9. Metastasis to the spinal cord from carcinoma of the prostate

closely simulates primary cord tumors and often occurs when the prostate is but slightly enlarged.

10. Pain is absent in one-fourth of all cases with metastasis.

11. Urinary symptoms are absent in 11.5 per cent. of all cases with metastasis.

12. Neuralgic and rheumatic pains in men above middle age, even in the absence of urinary symptoms, should suggest the possibility of carcinoma of the prostate.

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